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Volume XIII, No. 11

ORIGINAL ARTICLES

EDITORIALS

SPECIAL SECTION

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INTERNATIONAL ABSTRACTS

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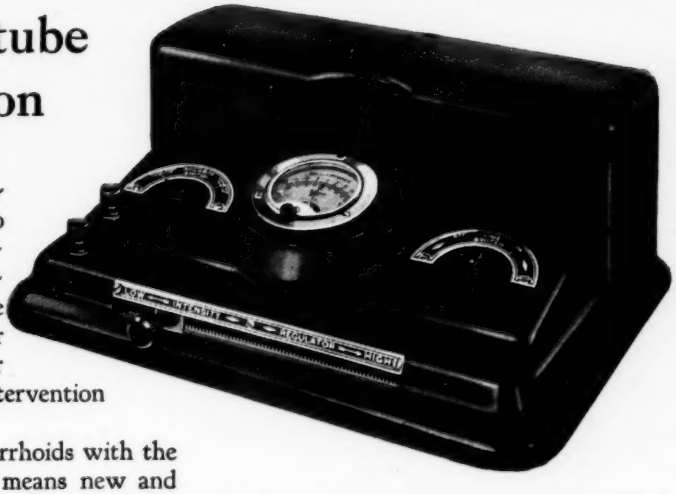

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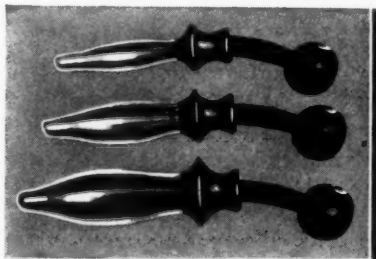

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THE TEACHING OF PHYSICAL THERAPEUTICS IN THE DENTAL SCHOOL CURRICULUM *

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NEW YORK CITY

Physical therapeutics has not as yet been made an integral part of the dental curriculum. I cannot say that dental schools are teaching it at the present time, if we are to judge by the low percentage of the thirty-eight dental schools in the United States that are giving attention to this subject. In few dental institutions, if any, is a chair established in Physical Therapy. Therefore, the subject of my discussion must be approached rather from the angle of possible accomplishments in the future by incorporating this subject in our teaching program, and not from the standpoint of what has been accomplished to date. I shall, therefore, deal with the possibilities and benefits from oral physical therapeutics in stomatology and the need of oral physical therapy instruction in the dental school.

Medical Recognition of Dentistry's Newer Status

It is a most significant event, and I have no doubt that it will be epoch making in the history of medicine and dentistry in the United States, that such a representative organization as the American Congress of Physical Therapy composed of leading physicians, medical specialists and dental surgeons, at a gathering for the purpose of discussing physical therapy problems in medicine and surgery accords recognition to the work of dentists. The establishment this year of a special section where the work of dental surgeons is on equal footing with other practitioners of the specialties in the healing art is most noteworthy. I am inclined to believe that the progressive element in dentistry and medicine will disregard the earlier rebuffs to our profession and look to a brighter future of harmony and co-operation between dentists and physicians. It is interesting to observe that the great surgeons have given the deserved recognition to dentistry. Noted among those was the well-known American surgeon, Dr. Roswell Park, Professor of Surgery at the University of Buffalo. In 1896, in an address before the dental department of the same institution, he accorded dentistry due recognition in his remarks:

"The man who would be an ideal oral surgeon must be not only generally familiar with anatomy and physiology, but must thoroughly know the embryology of the face and teeth, the physiology not alone of the organs of the mouth, but of all the secreting glands and the chemistry of all their secretions; not only the anatomy of the cranium, but general anatomy as well, and even comparative anatomy. He must be well informed in the explanations of all the congenital defects met about the face and mouth; he must be familiar not only with the ordinary principles of pathology and bacteriology, but he will find in the fluids about the mouth such a fertile opportunity for bacteriological study that, be he ever so expert or erudite, he has still much left to investigate in this direction. There is no disease germ with which he can afford to be unfamiliar, and, as any form of tumor may be found in or about the mouth, he should be familiar with the entire subject of tumors and their surgical treatment."

It is most unfortunate that the educational problem in dentistry has overshadowed the more important issues of science, practice and service to the public. Dentistry must not be judged as a thing apart from its own history and our social environment. Surely, recognition must not be delayed because of some of its educational handicaps. Dentistry's achievements have earned its recognition. My presence here this evening bears witness to this fact. Permit me to dwell a bit on the advanced status of dentistry and its position as a medical and surgical branch in the healing art and science. Let us disregard this evening the technical educational problem.

What Is Present Day Dentistry?

What is dentistry today? Has physical therapy a place in dental practice? These questions may be dealt with, quite inde-

* Read at the Eleventh Annual Session of the American Congress of Physical Therapy, Section on Stomatology, New York, September 9, 1932.

pendently of the fact that the teaching of this subject has no definite place in our teaching generally. It cannot, however, be intelligently discussed without a thorough comprehension of what dentistry is, what it comprises in actual practice. It is especially important that deans of medical schools as well have more than a superficial acquaintance with the content of dentistry, if we are to learn from others as to what and how to teach dental students and graduate stomatologists in electrotherapy.

To say that dentistry is concerned with cosmetic effects is like identifying dermatology with cosmetology and beauty parlors. To say that dentistry is a mechanical art, a jeweler's handicraft is to overlook the fact that, as practiced today, it is called upon to deal with problems of a biological and medical character. And unless we appreciate that, where could we possibly find use for ultraviolet radiation in the treatment of Vincent's disease, infrared therapy in oral fractures, medical diathermy in facial neuralgias, surgical diathermy, x-ray therapy and radium in oral cancer?

This evening we want to direct our attention to clinical dentistry and note its practical applications in the effective care of oral patients. Ideally the purpose of all healing is the alleviation of human suffering, whether this be caused by or manifested in one organ or another. In this respect, dentistry shares equally in its responsibilities and duties with other branches of medicine. It also takes joy in the privilege of ministering to the health needs of the people. Here we find the scope of dentistry or stomatology for public service limitless.

The dental practitioner of today is called upon to treat an array of pathologic conditions of the mouth that taxes his diagnostic skill and intellectual keenness to a degree comparable to any other special field in medicine. He has far greater responsibilities today, as compared with the past, in his own practice and in co-operation with his fellow physicians. He is responsible for the surgical care of mouth diseases, and that he has met this responsibility squarely is shown by the splendid achievements in oral surgery. In his medical care of dental patients, he has shown no less ability to utilize the science of healing. We observe him attacking energetically the problems of curtailing the increase of Vincent's disease.

Offer him a new method that promises to be of value in the oral field and he is ready to enthusiastically receive it, analyze its merits and when found scientific and practicable, adapt it as part of his practice. That we are not behind the times, is evidenced by our presence here. The program of the section of stomatology of this Congress has answered the question that dentistry has expanded to a point of equality with other medical specialties. As a medical specialty, dentistry can benefit as much from physical therapy as do the other fields of medical practice.

The Extent of Application of Oral Physical Therapy

There are a number of surgical mouth conditions where physical therapy has been found valuable. Similarly, a number of nonsurgical mouth conditions have been helped by physical means. We have so far not been able to estimate in any practical way the extent of application of physical therapy in dental practice. From the educator's viewpoint it is important to know the demand for this type of treatment. We can make some guesses about it in this manner. The hospital number of the *Journal of the American Medical Association*, March, 1928, reports that *one-third* of the general hospitals of the United States have physical therapy departments. Likewise, approximately *one-half* of the industrial and of nervous-mental hospitals, and 42 out of 62 orthopedic institutions have also reported similar departments. These figures show where physical therapy is primarily recognized in institutional work. In March, 1929, *one-half* of the general hospitals reported a department, a very substantial increase in one year. It is believed that this number is likely to increase further, especially since the American College of Surgeons has urged that all class A hospitals possess full fledged physical therapy departments.

With regard to our own field we have no statistics as to the number of dental clinics that have facilities for physical therapy care of patients. From the report of the special committee of the section on stomatology of this Congress, I am informed that about one thousand dentists have purchased equip-

ment for ultraviolet treatment and about five hundred have been using diathermy.[2] The literature is also very meagre as to quantity, the number of papers published in the past ten years not having even reached the mark of three hundred. We have little information as regards the research projects undertaken or completed in the past and those now in progress.

In relation to our own institution, I am pleased to be able to say that our Oral Surgery Department under the progressive leadership of Professor Leo Winter, our students have been receiving instruction in this subject. The announcement in our 1932-1933 dental school catalog[3] reads, in part, as follows:

"The oral-surgery clinic includes also the physical therapy section, which is provided with ultraviolet, infrared and diathermy apparatus, where students are assigned to receive instruction in theory and practice of oral physical therapy. Instruction is given in the wave theory of energy, the physical and biochemical properties of light, the therapeutic value of light, sources of artificial light, dosage and clinical procedure in the use of ultraviolet and infrared artificial light in preoperative conditions of the mouth. The dosage and technic are recorded for study of results."

Early Clinical Application of Physical Therapy in America

The earliest records of the application of ultraviolet light in dentistry, in America, and its practical value in pyorrhea are found in the dental press.[4] Attention to this type of treatment in pyorrhea cases which have not reached the so-called hopeless stage was directed by O. Hoyt.[5] At the same time work with the Kromayer lamp was carried on in pyorrhea at Tufts dental school.[6] Medical diathermy was reported in use in dentistry by Shea.[7] The application of heat in the treatment of pyorrhea was found successful in a number of cases reported by Lurie.[8] Norris[9] found surgical diathermy practiced in the treatment of pyorrhea, oral tumors, oral abscesses, etc. The interest seems to have turned mainly toward ultraviolet therapy to which subject considerable time was given in the official journal of American dentistry by Rasmussen.[10] Its application to the entire field of dentistry was described in a special publication by Reade,[11] issued by the Canadian Dental Research Foundation. The field expanded in both directions, wider and deeper, for we find Price[12] undertaking his laboratory and clinical researches dealing with calcium and phosphorus utilization in health and disease, the rôle of activators for calcium and phosphorus metabolism, the nature and source of calcium and phosphorus activators and related problems applied to dental and oral conditions.

The application of ultraviolet and infrared rays in the treatment of a considerable number of cases at our own institution were reported by Winter and Hays,[13] and by Murphy.[14]

This resumé is indicative of the efforts in this field on the part of oral clinicians. The oral conditions that have come under clinical observations included chronic and acute Vincent's infection, pyorrhea, caries, postoperative pain, dry socket, rarified bone fractures, osteomylitis, fistulae, periapical infections, root canal therapy, apicoectomy, trifacial neuralgia, post-extraction, infections, antrum involvement, facial pains, oral cancer, involvement of mucous membrane, and many other conditions which the dentist encounters in his practice of stomatology. Rosewarne, in his textbook, devotes considerable space to mouth conditions that are effectively treated by physical means.[15] The scope of application of this new method to conditions of the mouth is broad enough to warrant wider clinical investigation. By the development of well defined methods of procedure, both in technic of application and observation of cases on a sufficiently large scale, we shall be in a position to bring to the dental student a richer source of dependable information.

The Dental School as Leader

The purpose of dental education and the function of the dental school is, in my opinion, twofold. The major function of dental education is to prepare practitioners to treat diseases of the mouth, face, teeth and jaw bones. Secondly, it should carry on research. This implies the need of a satisfactory training of the dental surgeon in modern methods of diagnosis and treatment. Realizing as we do the need of co-operation between the various specialists, and this includes the stomatologist who is called upon to act as consultant, it is logical that he needs to be made familiar with all the thera-

peutic measures known and applied in modern medicine and surgery. There can no longer be a question that a lack of training in physical therapy methods is a handicap to the dentist, from the standpoint of co-operation alone. There is another phase to be considered, namely, the actual treatment of mouth conditions with physical means and their indications and contraindications. It has been reported that conditions have been improved considerably with ultraviolet treatment, infrared treatment, and diathermy treatment. Ignorance in itself is not sufficient cause to condemn the labors of others as valueless.

With regard to research, it is equally imperative to bear in mind the need of properly trained oral clinicians. They are needed to carry on a full program of research in the various problems of oral disease. We see, then, that the dental school will more faithfully perform its duties as an educational institution by adopting a more liberal attitude toward the teaching of physical therapy as part of its teaching plan.

That physical therapeutics deserves a place in the University Dental School is not doubted in my mind. I understand that a considerable number of American University medical schools, and post-graduate medical schools, are giving instruction in this subject. I was interested to note that at a general session of the 5th International Congress of Physiotherapy,[15] held in Liege, in September, 1930, the question of the University teaching of physiotherapy was discussed, and the following recommendations were approved:

1. Physiotherapy has an equally important place with surgery and pharmacology in the training of medical students, and should be taught theoretically and practically by courses of clinical instruction.

2. Physiotherapy should be an obligatory subject of teaching during at least two terms, and should be submitted to independent examination.

3. Teaching of physiotherapy should be undertaken by an autonomous professor who has at his disposal the essential material and personnel of teaching, including patients.

4. To attain this end, it would be useful to establish University Institutions of Physiotherapy, organized as clinics or polyclinics. These must be accessible to patients from other clinics. as well as to the doctors of the neighborhood.

5. The Institutes should be provided with all the scientific organization necessary for physiotherapy.

In addition to these considerations there is one more thing we must not overlook. The dental field is not yet contaminated with commercialism. I can see in this another forceful argument why the dental school should become the leader in oral physical therapy to guard against the destructive influences of empiricism.

Physical Therapy Research

Research has a very definite place in the dental school. Aside from its stimulating influence on the student body in developing an investigating and an inquiring attitude toward problems, it enables those associated with the institution to focus attention on unsolved problems. It is a first aid to the teacher. It does away with the old conceptions that prevailed in dentistry in the past that there is a practical and a theoretical dentistry. In a school environment where active research is conducted, the student soon learns to differentiate between the empirical and the scientific. He acquires the habit of seeking the scientific because it is the practical.

From my remarks, you have noticed that our knowledge of physical therapy applied to mouth conditions has come mainly from the hands of practitioners. How many practitioners in dentistry or in medicine are true clinicians is hard to tell. But for purposes of scientific progress in this field of stomatologic development, we must be assured of the scientific value of these labors in the future. Research in the dental school can be of great value also to those outside of the institution in guiding them by proper methods of investigation. The dental school must also participate in future research projects, clinical or experimental.

We have in progress a bacteriological study of the effects of ultraviolet ray treatment on post-exodontic conditions. The work has been conducted by Professor Winter with the co-operation of Professor I. Weinstein, of the bacteriological department of our medical school. A preliminary report was presented before our staff conference and will presently appear in print. A survey on a similar subject has been conducted at the University Hospital, at Ann Arbor, Michigan, and reported in the *Dental Cos-*

mos, in October, 1930. These reports seem to indicate that ultraviolet rays is an aid in the relief of after-pain and swelling in extractions. The significance in university supervised investigations, lies in the fact of its reliable methodology. It lends confidence to the authenticity of its findings.

Looking Forward

Considering the handicaps of dentistry in the past, it will be granted by impartial observers that the dental profession has accomplished considerable in physical therapy. In 1931, American dentists participated in the International Dental Physical Therapy Congress held in Paris, where our efforts have shown themselves to be very outstanding. Our present program at this Congress is also a promising one. There is every reason to believe that the future will bring greater results than in the past. I was impressed with an editorial comment that appeared in the official journal of this Congress, in 1927. In view of my expressed feelings and beliefs as to how I stand in regard to physical therapy applied to dentistry, I feel like saying to the dentist today what Greene[17] said to the physician, in 1927:

"There is no such thing as a physical therapist *per se.* Every physician should use physical means in his practice. Every physician knows that it is necessary to make the diagnosis of the case first before any treatment is instituted. There is no such thing as turning on a machine, any machine, and expecting improvement of the patient simply from the fact that physical therapy is used. It is necessary to know what are the proven points in the use of any physical agent to restore health. All are impressed with the fact that the use of physical apparatus means the call for the utmost accuracy at every step.

"We all know that there have been unfounded claims. There have been bad habits and some quackery. Happily, many of these are being eliminated through the medium of such associations as this and we are to be commended upon this attainment and, I may add without apology, that physical therapy has not presented as many unfounded claims as can be found in other so-called remedial agencies for human ills. The ancestry of medicine does not give us much to be proud of, in many instances."

While we recognize that the treatment of local oral disease is the first essential, a great deal of help may often be obtained by a careful consideration of the mental and physical condition of the dental patient, and by a judicious employment of therapeutic measures designed to improve his general health. We really no longer think only of the mouths of our patients. A human being is a living organism of a highly complex nature, whose health depends upon the health of every individual cell of which the organism is composed. It makes little difference whether the initial lesion is situated in the jaw, the appendix, the heart, or the tonsils. Local therapeutic measures must, of course, vary according to the situation of the initial lesions; but in every case treatment in the broad sense must aim at providing the individual as a whole with the necessary extra strength to enable him to resist the attack of the invading organism, whatever this may be.

As oral specialists, we are now taking a broad view of the treatment of oral diseases. We need not for one moment relax our vigilance as regards local treatment, but, at the same time, we must treat the patient as a whole. This is a view shared by dentists everywhere, especially in England.[18] If we pursue our development in the future with this broadened concept of dentistry, I believe that Physical Therapy will become as indispensable an aid in our therapeutic armamentarium as are our other means for treating oral disease.

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THE PRESENT TREND IN TUBERCULOSIS MORTALITY *

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For several years, prior to, and during the present period of economic stress, a large proportion of those individuals interested in tuberculosis control have prognosticated an increase in tuberculosis mortality. Not only has this increase failed to materialize, but a consistent decrease in the mortality from this disease has been shown. A new low record of 67 deaths per 100,000 population was achieved for the registration area of the United States in 1931. This new record compares with a mortality of 201 per 100,000 in 1904, which latter mortality, if applied to the present population, indicates an annual saving of over 150,000 lives from his disease alone. This remarkable achievement cannot be attributed to any one single factor. We can, however, enumerate the most important contributing aids:

1. *The discovery of the tubercle bacillus by Robert Koch in 1882* determined the cause of tuberculosis and enabled the various modes of distribution of this disease to be determined, so that protective methods could be devised, not only to aid in detecting its presence, but in preventing its spread.

2. *The building of tuberculosis sanatoria,* starting in this country with Trudeau's institution in the Adirondacks in 1885 and expanding to approximately 76,000 beds in institutions for tuberculous today, has accomplished much. This has facilitated the treatment of the tuberculous and prevented the spread of infection from those individuals who, when hospitalized, could not disseminate it. Along with this, came the development of tuberculosis clinics, both stationary and mobile, by private and public health agencies, further facilitating the recognition of the disease.

3. *In 1904 the organization of the National Tuberculosis Association* inaugurated a campaign of propaganda, lay and medical, directed specifically against this disease. This has continued with increased fervor and efficiency.

4. *Improved Public Health Standards:*

(a) The reporting of tuberculosis to the public health authorities as a contagious or infectious disease, first initiated into this country by Herman M. Biggs in the State of New York, was one of the most progressive steps in the control of the disease. The report, or notification, to the health authorities immediately makes known the location of the individual so afflicted and allows supervision of that individual.

(b) The protection of the public from tuberculous food supplies, particularly milk, was accomplished through the institution of

* Read at the Eleventh Annual Session of the American Congress of Physical Therapy, New York, September 7, 1932.

tuberculin testing of cows and the destruction of those cows which are diseased. This, plus the pasteurization of milk, has, in communities where such measures are practiced, made gland and bone tuberculosis a rare condition.

(c) The improvement in general health, which has resulted from the continuous battle against many other diseases, such as typhoid, smallpox, diphtheria, malaria, yellow fever and nutritional disturbances, such as rickets, has greatly improved the health stamina of the country and lessened the susceptibility to disease, such as tuberculosis.

5. *Improved Standards of Living:*

(a) Housing.

Housing has been materially changed. The recognition of the dangerous element to the health of the laborer in the old industrial establishment such as the sweat shop, has accomplished a new type of architecture, with health as a basic factor. Private homes and apartments, with adequate provision for ventilation and lighting, have been built to care for the growing population. In many instances the old homes of several generations, which may have harbored tuberculous infection through generations in one family, have been destroyed, eradicating this possible source of disease.

(c) Industrial hazards are gradually being remedied, as evidenced by legislation which is constantly being promoted and passed to protect the worker from such hazards as occur for example in the dust-borne occupations. Industrial health organizations, making preliminary physical examinations, seeking out hazards of employment and improving environment of employment, have also been factors.

(c) In more recent years medical science has been determining that certain vitamine substances, as well as mineral balances in the diet, are essential in maintaining a resistance against disease. The dissemination of knowledge concerning the newer research in the values of foodstuffs and diet, in the protection of the health, is aiding in the upbuilding of the nation.

6. *Newer methods of treatment* have been instituted in certain forms of tuberculosis. Such treatment has been of greatest value in those forms of the disease which were considered almost hopeless under previous conditions.

(a) Ultraviolet therapy, both natural and artificial, has contributed considerably to lowering the mortality, both in intestinal, laryngeal and surgical tuberculosis.

(b) Compression therapy is becoming much more widespread in its use through the training of medical men in its application and through the education of the public to its value.

Artificial pneumothorax, phrenic exeresis, and thorocoplasty are responsible for the saving of many thousands of lives of individuals who have had the benefit of these methods, properly instituted. The control of the tuberculosis existing in these individuals has been a benefit to the public health in many cases in preventing the expulsion of tubercle bacilli from the uncontrolled active tuberculous disease process which existed prior to such treatment.

But, even as these various methods were being promulgated with increased efficiency and results were being evidenced in decreasing mortalities, an economic upheaval affecting this and all other countries came to perturb the minds of those whose principal interest was public health, and in tuberculosis a renewed prognostication of higher death rates appeared. The new prognostication was based principally on four factors:

1. Unemployment.
2. Mental anxiety, with its incidental breaking down of physical resistance.
3. Curtailment of food supplies.
4. Increased congestion in homes, due to doubling up of families as a result of inadequate incomes.

Over two complete statistical years have passed since the onset of this financial debacle and, for the year 1931, statistical evidence points to the healthiest year that this country has as yet seen. The experience of the Central Powers in the World War taught us that mental anxiety the curtailment of food supplies and congestion in housing may cause a doubling, trebling and even quadrupling of the tuberculosis death rate. Why has this not occurred in our country? To counteract any increase in the mortality, especially from tuberculosis, we find:

1. That unemployment has taken the excess funds from the general population. This has produced a simpler form of living, with more relaxation and an elimination of the intense fatigue produced in the era of high industrial production and constant pleasure-seeking. Especially is this true in the years of younger adult life. Today, in our large cities, thousands of individuals are found out of doors in the parks and at the beaches enjoying a more natural life.

2. Food curtailment has not occurred to an extent where starvation of bodily tissues has broken the individual's resistance to disease. The farm crops of this country are still more than adequate to care for the population today existent. Food prices have also shown a considerable decrease and simpler menus are more the rule. In those areas where unemployment and drought have been very severe, private and governmental agencies have functioned to render a satisfactory aid. This must continue:

3. Epidemics of respiratory infections are usually followed by increases in the incidence of tuberculosis morbidity. Acute respiratory disease very frequently is responsible for the activation of an old tuberculous process. There has been no such epidemic in the past several years. The absence of such epidemics should also be considered a factor in the fine record which has accrued to the people in health, particularly as regards tuberculosis.

4. The era of great industrial activity in the latter years of the World War and in the years subsequent to that war created a movement of the population from rural communities, particularly off of the farm, into urban centers of industrialization. In the current year, up to July first, a reversal of this form of migration has taken place and, according to the estimates of the Department of Labor, over 500,000 individuals had left the cities for the farm in the first six months of this year. This has, to some extent, lessened congestion in housing and has undoubtedly been a factor in the improved morbidity and mortality. It has likewise aided in lessening the burdens carried by those associations which are functioning in economic and social relief. I would also point out that in the estimation of population during the interim of federal censuses, statisticians should not fail to give consideration to this shifting of population in their health tabulations for the respective districts.

5. Immigration into the United States due not only to the revision of the laws, but to the economic upheaval existing throughout the world, has been curtailed to a point where it is less than the emigration. A large proportion of those individuals coming to this country in the past years has been recruited from the ranks of the laboring classes and has found it necessary when they at last settled, because of their limited resources, to reside in areas which are termed blighted. The health hazards of such housing aid in contributing to the incidence of illness in these various groups. The decrease of such newcomers is, I consider, a most important health contribution at this time. Another factor in immigration and migration which was creating one of the most serious and menacing conditions from a health standpoint in the United States during the past decade is now also being remedied. Five years ago I called to the attention of the health officials and public of this country the development of this extremely menacing condition. I refer to the migration of the negro from the sparsely settled districts of the south and the immigration of the Mexican peon to the urban centers of industry. The people of these races were imported to serve the need of cheap labor. They were lured to the city with what was comparably a high wage. They were given the dregs of housing and living congested under poorest of sanitary conditions, which, combined with unaccustomed hardshiping labor, destroyed whatever resistance primitive racial groups have to tuberculosis. Coming in contact with tuberculous infection they readily developed the disease and rapidly succumbed to its ravishes. Living in crowded quarters, those afflicted disseminated more infection to their immediate associates, and traveling the highways sowed the seed for more disease in the communities in which they lived.

The establishment of this great need in industry for cheap labor following our entrance into the World War sent the carpet-bagging labor agent into the south of this country and a stream of negroes counting into the hundreds of thousands were soon found entering large industrial centers. Their arrival created needs for extension of health activities, which did not immediately prove fruitful. Industrial need for labor has declined, but the negro laborer remains. His index of unemployment

is three and four times as great as that of the white man. Removed from his home in the south to the attractions of urban life, he has in this laboring group become an object of charity. No plans have thus far been promulgated to change his present social status. Temporarily relief organizations have been able to cope with the more serious aspects of this condition. If the industrialists who moved him from his former home to the dangers of the city, where he now idles, cannot return him to his previous home, our government perhaps might institute a trek in colonization back into the southern climes, where the people of that race show greater adaptability.

In the year 1929, considering the Mexican alone, it was estimated that over three million of that racial group had become residents of this country. The tuberculosis mortality computation for Mexicans in this country ranges in different communities from 300 to 900 per 100,000 of their population. Therefore, the total tuberculosis deaths from this source alone represent a considerable number. During the past eighteen months an enlightened Mexican government through its consular service cooperating with local relief agencies has aided the return of approximately 1,300,000 of these Mexicans to their country, and this exodus continues with little interruption. In greater Chicago in 1929, there were approximately 30,000 distributed in the various colonies about our community. Recent surveys indicate only approximately 6,500 to 7,000 remaining and contingents of one hundred or more leave the community almost every week. If one computes the total number of deaths from tuberculosis, for this group who have returned to Mexico, on the basis of a minimum average of 300 per 100,000, the tuberculosis mortality statistics of this country should be decreased by at least 3,900 due to this emigration. One should also consider further benefits that would accrue in lessening the number of such individuals who might spread disease during the interval of their illness prior to its fatal termination. There have also been decreases in other of the primitive racial groups in this country — in the Philippinos on the western and the Porto Ricans on the eastern coast.

To determine whether the decrease in mortality portended by the above was a fact, three weeks ago I addressed a communication to the Commissioners of Health of twenty-five states in different parts of this country, asking for the mortality statistics on tuberculosis for the current year. Ten of these states, representing a population of over fifty-two million, had already completed the computation of mortalities for the first six months of the current year, so that a comparison with a similar period in 1931 could be made.

COMPARATIVE MORTALITY STATISTICS OF FIRST SIX MONTHS OF 1931-1932

	Population 1930	Jan. to June 1931, Incl.	Jan. to June 1932, Incl.
New York	12,588,066	4,619	4,324
Pennsylvania	9,631,350	2,501*	2,312*
New Jersey	4,410,334	1,428	1,388
Ohio	6,646,697	2,290	2,060
Illinois	7,630,654	2,500	2,288
Kansas	1,180,999	366	322
Minnesota	2,563,953	576	569
Alabama	2,646,248	1,148	1,143
Kentucky	2,614,589	1,324	1,049
Louisiana	2,101,593	965	834
	52,014,483	17,717	16,289

* January to May, 1932, inclusive.

The figures above indicate a decrease of over 8 per cent in tuberculosis mortality in this group for the first six months of 1932 over 1931.

Furthermore, an answer to a personal communication addressed to Dr. Louis I. Dublin, of the Metropolitan Life Insurance Company, indicates for the same period, January to June, a decrease from 7,316 tuberculosis deaths among the industrial policy holders of that company, with a death rate of 81.9 per 100,000 in 1931 to 6,447 in the first six months of 1932 and 75.3. The rate of decrease in both groups is approximately the same.

These computations applied to the population of this country for the entire year 1932 would approximate 6,650 fewer deaths from tuberculosis. A new low record.

Conclusions

I. Tuberculosis mortality has shown a consistent decrease over a period of years to a new low record of 67 deaths per 100,000 population in 1931 for the United States.

II. The contributing factors in this decrease may be listed as follows:

1. Discovery of the tubercle bacillus.

2. Organization of public and private health agencies to combat this disease.

3. The building of tuberculosis sanatoria, now accommodating 76,000 patients, thus limiting the spread of infection and facilitating treatment; and the development of tuberculosis clinics for diagnosis and supervision.

4. Improved public health standards

through compulsory notification of the disease. The protection of the public from tuberculous food supplies and the improvement in general health resulting from improved nutritional standards and combat against other diseases.

5. Improved standards of living; new housing; the removal of industrial hazards. The institution of industrial health organizations for physical examinations. The dissemination of knowledge concerning recent dietetic research.

6. Newer methods of treating tuberculosis particularly lung compression which has aided not only in decreasing the mortality, but in controlling the tuberculous disease processes, so that the patients were not a menace to the general public through the expulsion of tubercle bacilli.

III. The recent economic disaster, through unemployment, mental anxiety, supposed curtailment of food supplies and congestion in homes, has not as yet created an increase in tuberculosis mortality. This is because unemployment has allowed more relaxation and outdoor life. Private and governmental agencies have functioned in food relief to render a satisfactory aid, which aid must continue, to prevent increase in mortality. Epidemics of respiratory infections have not occurred in the past several years to activate old tuberculous processes. A considerable reversal of migration has and is occurring from the farm to the city, which has lessened congestion and housing in urban centers. Immigration today is less than emigration, which further decreases the hazards developed in the poor housing of the immigrant laborer. The Mexican peon, who numbered approximately 3,000,000 in the United States in 1929, is now making a considerable exodus to his own country — which amounts to approximately 50% of that number and which continues in a constant stream. This in itself should be responsible for a decrease in tuberculosis deaths of at least 3,900 annually at this time and should further benefit the general population through lessened dissemination of infection. Similar decreases are occurring in other races. Statistics compiled for approximately one-half of the population of the United States and corroborated by the statistics of the Metropolitan Life Insurance Company indicate an approximate decrease of 8% in tuberculosis mortality for the first half of 1932 over 1931.

104 S. Michigan Ave.

Nation's Mental Health Unaffected by Depression

The economic depression has so far had very little effect on the mental health of the nation as seen in a survey of mental disease hospitals, results of which have been made public by the National Committee for Mental Hygiene.

A questionnaire study of over a hundred of the 173 state hospitals in the country showed no marked increase in new cases. Reports from hospital superintendents varied as to the effect the depression was having, but on the whole it seems to have been very slight so far. The chief effect seems to be on paroles and discharges. In all parts of the country patients who would normally be discharged or paroled cannot be because their families are unable to care for them.

Financial worries may precipitate a mental breakdown but psychiatrists realize that there is a tendency to overemphasize the last factor that appeared before the onset of the mental disturbance. After a study of many thousands of cases they are more than ever convinced that the mental disturbances are the results of an accumulation of strains, rather than a condition produced by one particular factor, such as financial worry or unemployment.

The National Committee for Mental Hygiene takes a hopeful view of the future, pointing out that the depression has been notable for the absence of violent mass behavior and that the average man and the average family have borne up heroically under the terrific pressure.

"This is a tribute to the essential sanity of America," declared Dr. C. M. Hincks, general director of the organization. "Fundamentally and ultimately the mind of America is sound." — *Science News Letter,* April 23, 1932.

RADIUM TREATMENT OF TOXIC GOITER *

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According to Crile,[1] "One point has been clearly established, and that is that hyperthyroidism is not the surgeon's problem alone — it is not the internist's problem alone — it is par excellence a clinic problem. There is practically no medical specialty which at some time is not concerned with the diagnosis or treatment of hyperthyroidism."

Under the term toxic goiter we include all types of non-malignant goiter associated with tachycardia, tremor, wasting, increased basal metabolic rate, nervous and mental manifestations, with or without exophthalmos. Clinically, the following three main groups are recognized:

1. Diffuse Toxic Goiter, variously labeled as primary exophthalmic goiter, primary Graves' disease, primary Basedow's disease, adenoid toxic goiter, etc. This type of goiter usually shows moderate symmetrical enlargement of the gland, soft, elastic in consistency, freely movable over the neighboring tissues, without or very rare evidence of slight compression. Only rarely does it reach a large size. On the other hand, in a not inconsiderable number of cases the enlargement may be slight or clinically imperceptible. In a series of 3,477 cases of Basedow's disease compiled from the literature and one hundred personally observed cases, Sattler,[2] in 1910, found that in the experience of different observers in from 0 to 40 per cent of the cases the thyroid was not enlarged in patients who for many years presented all the classical symptoms and signs of toxic goiter. Further studies since the appearance of Sattler's publication have amply confirmed the correctness of this observation.

2. Nodular or Adenomatous Toxic Goiter, variously known as secondary Graves' disease, secondary Basedow's disease, toxic adenoma of the thyroid, toxic adenomatous goiter, adenomatous goiter with hyperthyroidism, etc. It may present a slight, moderate or marked irregular enlargement, with or without compression of the neighboring tissues of the neck or mediastinum. Both from a comprehensive study of the literature and my own observations in hundreds of cases I am thoroughly convinced that marked mechanical compression is not the dominant clinical problem in the vast majority of cases of toxic adenoma who have come under medical observation in recent years. In toxic nodular or adenomatous goiter as well as in diffuse toxic or exophthalmic goiter the dominant clinical problem is toxicity. In many cases of toxic adenomatous goiter the enlargement is moderate or smaller than in typical primary exophthalmic goiter, and the compression is slight, symptomless or absent and does not form a major clinical problem. Indeed, it is in this group of small or clinically imperceptible toxic nodular or adenomatous goiters that the underlying thyrotoxicosis is frequently overlooked and the condition diagnosed as primary neurosis, psychoneurosis or primary cardiovascular disease of unknown origin.[3]

3. Nodular and Diffuse Toxic Goiter. This type less frequently stressed in the literature than the former two groups is frequently met with when a careful, clinical, palpatory examination is made. At the Mayo clinic approximately one-third of the toxic nodular goiter patients show a combination of diffuse and nodular enlargement.[4] In a small number of personally observed cases of diffuse toxic or primary exophthalmic goiter patients, small nodular masses were found, and in a much larger number of nodular or adenomatous toxic goiter cases diffuse enlargement was noted. In common with the first two groups of cases the toxic clinical manifestations show marked variations in individual cases and do not run parallel with the degree of enlargement.

Pathology

Pathologic History. In a previous study[5] on toxic nodular or adenomatous goiter it was stated: "In recognizing toxic adenoma as a clinical-pathologic concept, I wish to

* Read at the Eleventh Annual Session of the American Congress of Physical Therapy, New York, September 6, 1932.

stress strongly that neither clinically nor pathologically do I perceive any fundamental distinction between toxic adenoma and exophthalmic goiter, except as the variation of a single disease. . . . In exophthalmic goiter, the entire gland is diffusely involved in the pathologic process; hence, the symptoms are usually more marked and surgical resection is less satisfactory. In toxic nodular or adenomatous goiter, the thyroid gland shows one or several areas of involvement with intervening healthy tissue between the affected areas; hence, the symptoms are usually milder and surgical resection more satisfactory." In both, the essential pathologic process consists in areas of hypertrophy and hyperplasia of the parenchymal tissues, alteration, degeneration, diminution or disappearance of the colloid secretion from the active areas, round cell and lymphoid infiltration and increased vascularity in the early stages followed by cell degeneration, fibrosis and other regressive changes — the end stage of which may be extreme reduction of normal thyroid parenchyma with resulting myxoedema. From a radiotherapeutic standpoint it is, however, very important to remember that toxic adenomatous goiters may be bulky, that the active toxic areas may be small and the greater portion of the adenomatous goiter may be the seat of radioresistent regressive changes or colloid distended follicles.

Pathogenesis. The study of sectioned tissues under the microscope clearly reveals definite pathologic changes in the thyroid glands of patients presenting primary or secondary Graves' disease. These pathologic changes reveal more than mere compensatory hypertrophy and hyperplasia of the glandular elements. They show alteration, diminution, degeneration and disappearance of the normal colloid secretion. There is functional and structural cellular alteration, degeneration and death with round cell and lymphoid infiltration and replacement fibrosis. There may or may not be any increase in vascularity. The morphological changes strongly suggest that the clinical manifestations in primary and secondary Graves' disease are produced by a diseased thyroid gland: on the one hand, by an altered thyroid product — dysthyroidism, and, on the other, by deficiency of normal secretion — hypothyroidism.

Etiology

More than one hundred years have now elapsed since Parry[6] first described both primary and secondary toxic goiter. Since then a voluminous literature has sprung up dealing with the etiology of the disease that eponymically should have been best known as Parry's disease. Until the present time the basic cause of toxic goiter remains unknown.

We have learned some of the predisposing conditions. We know it occurs more frequently in women than in men, — 3 to 1, 5 to 1, 10 to 1, or even 15 to 1, according to the experience of different observers. But we don't know why it occurs at all in either sex. We know that it occurs most frequently during the period of active sexual life in women. But why does it occur in children of both sexes before puberty? One of the severest cases on record in the literature is that of a boy, aged two and a half years, reported by Schwekendick. The disease in this child ran an acute course, with bilateral exophthalmos, bilateral corneal ulceration and panophthalmitis, and the patient died with symptoms of severe toxemia and myocardial insufficiency four months after the onset of the first symptoms.

Why does it occur in both men and women after the fifth decade of life, when the peak of sexual activity is passed? How are we to explain why millions of women who go through puberty, pregnancy, puerperium, physical and psychic stress and strain and all sorts of infectious diseases never develop primary or secondary Graves' disease?

From the very beginning of the clinical recognition of Graves' disease the importance of psychic trauma has been greatly stressed by numerous observers as the most frequent exciting cause of the disease. A careful personal study of this problem in hundreds of patients of primary and secondary Graves' disease has convinced me as it has convinced many other competent students of the disease that psychic trauma is merely a precipitating or aggravating factor to rouse into activity a pre-existing, smouldering or latent form of thyrotoxicosis. "I confess with humiliation," Hertzler[7] writes,

"that for twenty years when . . . a history of nervous trauma in which the patients relate definitely that their disease followed a severe nervous shock . . . was related to me I accepted it as a fact. After my scepticism was aroused, a careful history usually disclosed evidence of symptoms easily referable to goiter. Since I have studied these cases more thoroughly, I have not seen any in which a sudden nervous shock could be accepted as an etiologic factor. Obviously one affected with a mildly toxic goiter will react to nervous excitement more than a normal person."

Psychic trauma unquestionably will precipitate into fulminant activity a gently slumbering or apparently quiescent toxic goiter, but it does not explain how the mildly toxic goiter first originated.

When it is pointed out to the protagonists of the neurogenic theory of Graves' disease that the most intense and prolonged psychic trauma in millions of individuals is not followed by the development of either primary or secondary Graves' disease, a constitutional factor, heredity, neuropathic soil or previous autonomic imbalance is invoked to explain why psychic trauma will produce thyrotoxicosis in predisposed individuals. But what proof have we that these predisposed, high-strung or autonomically imbalanced individuals are not the subjects of a mild grade masked thyrotoxicosis, for many years before they develop the fully recognizable clinical symptoms of the disease? Is not thyrotoxicosis a disease which affects all ages, even childhood and infancy? The mild or frustes forms of the disease are by no means as rare as the literature would have us believe.[8] May not many a case of nervousness, high-strung state or autonomic imbalance be merely an atypical, larval or masked form of thyrotoxicosis? Personally, I am thoroughly convinced that many cases diagnosed pure neurosis or nervousness are larval types of thyrotoxicosis. In a recent study[3] I have dealt comprehensively with this problem and will not enlarge upon it here except to point out that many an autonomically imbalanced individual when successfully treated by subtotal thyroidectomy or radiotherapy or general medical treatment, lost the autonomic imbalance and became a well-poised individual ready to shoulder the kinetic drive of the life struggle without becoming easily unbalanced.

In recent years, with the development of bacteriology and the great popularity attained by the theory of focal infection in the etiology of numerous complaints, this doctrine also gained popularity as an important etiologic factor in the development of Graves' disease. We fully agree that focal infection, oral, gastrointestinal, respiratory, urinary, genital or wherever it be, may fan into activity an apparently innocent or "simple" goiter, but we do not believe that it is the basic cause of goiter, toxic or non-toxic. Not once during the pandemic of influenza of 1918, when I had the opportunity to study more than two thousand cases did I witness the development of a single case of Graves' disease, either during the stage of acute illness or convalescence. Nor does twenty-four years of private and institutional medical practice present to me incontrovertible proof that focal infection is more than a mere precipitating or aggravating cause of a pre-existing thyrotoxicosis.

The same remarks apply to so-called iodin "hyperthyroidism." In common with Trousseau,[9] who visualized this problem in 1862, we repeat:

"When we see that such feeble doses as 10 mgm. of iodin given once in twenty-four hours are able to produce severe intoxication . . . we are inclined to think that these . . . individuals had already been affected with exophthalmic goiter. . . . Every day, in every country, in Paris as well as in Geneva, iodin is given in large doses as high as two, three, or four grams in twenty-four hours. Never have any accidents occurrred, although the same dose of medication has been kept up for several weeks. Therefore, when we see, on the contrary, that almost infinitesimal doses of iodin do at times produce . . . enlargement of the thyroid gland, bulimia, and various nervous manifestations, we must admit that in these exceptional instances we are dealing with cases of exophthalmic goiter."

Nor does any incontrovertible proof exist that any other ductless glands stand in any other etiologic relationship to the development of Graves' disease than as mere precipitating or aggravating causes. Most frequently their disturbances are to be looked upon as secondary to thyrotoxicosis, less

frequently as incidental associated conditions. A detailed study of this problem will form the subject of an independent study and cannot be entered upon at present.

Therapy

Medical Treatment. With a mere knowledge of the predisposing and precipitating or aggravating causes of Graves' disease and utter ignorance of the basic cause of the disease, no specific medical therapy has been developed. Medical treatment chiefly concerns itself with reducing the physical and psychic load, with general supportive measures, symptomatic treatment and removal of aggravating factors, physical, psychic, infectious and toxic. The results have been gratifying in many mild and moderately severe cases. But the failures have been many in the severe cases and the mortality of pure medical treatment has been by no means negligible. Thus Sattler in a series of medical cases compiled from the literature for the years 1856-1910 found an average mortality of 11 per cent. Kessel and Hyman,[10] recent strong protagonists of medical treatment of Graves' disease, report a mortality of pure medical treatment of 17.4 per cent, and Fraser[11] of St. Bartholomew's Hospital, London, reports, in 1930, ten deaths in twenty-six patients treated medically — a mortality of 38.4 per cent. I am well aware that some internists have obtained unusually brilliant results and have recorded no mortality[12] in large series of cases, but this has not been the experience of the majority of clinicians who were confronted with the severe forms of Graves' disease.

Surgical Treatment. The unsatisfactory results of pure medical treatment in the severe types of primary diffuse toxic or exophthalmic goiter and especially in nodular or adenomatous toxic goiter, have resulted in ever larger demand upon the surgeon for operative intervention upon the thyroid in all types of toxic goiter. With improvement in surgical technic, more extensive surgical resection and preoperative use of iodin, surgeons have been able to show reduction in mortality and an increase in clinical cures. Encouraged by these results many surgeons have become emboldened to declare that all types of toxic goiter are purely a surgical therapeutic problem and that operation should be performed as soon as a definite diagnosis of thyrotoxicosis is made. However, no one who has carefully studied the entire problem of surgical therapy in toxic goiter can fail to be impressed with the fact that surgical mortality is still a factor to be reckoned with in the operative treatment of toxic goiter, even if one is willing to overlook the fact that survival of operation is by no means synonymous with the cure of thyrotoxicosis. Statistics gathered by three famous surgeons,[13, 14, 15] showed that during the years 1894-1902 the operative mortality ranged between 5 and 13.9 per cent; during the years 1902-1912, 1.3 to 30 per cent; during the years 1912-1922, 0 to 32.9 per cent; and, during the years 1922-1932, 0 to 48 per cent without the preoperative use of iodin, and 0 to 27 per cent with preoperative iodin administration. Other methods therefore deserve the earnest attention of the profession.

Radium Therapy. To the surgeon Abbe,[16] of New York, belongs the honor of having been the first, in 1904, to use radium in a bad operative risk case of classical exophthalmic goiter. The results were most gratifying. After a single treatment of 2,400 mgm. hours of radium given interstitially in the thyroid, the patient made a complete and uneventful recovery in four months and remained entirely well without any signs of recurrence for twenty-two years, the entire period of Abbe's observation. Notwithstanding this brilliant therapeutic result achieved by a single application of radium in a very severe case of exophthalmic goiter, further reports were slow to appear in the literature.

In 1913 a single line was published by Pinch[17] of the London Radium Institute, stating that four out of six cases of Basedow's disease treated by radium showed improvement. In 1914, Halstead, one of the foremost American surgeons,[18] reported a case previously thyroidectomized by him. He stated: "The gradual development of two nodules, the remains of the thyroid isthmus . . . had caused the patient great anxiety. . . . Furthermore she experienced a feeling of oppression behind the sternum which had been a constant source of annoyance and occasionally of distress. . . . After a prolonged exposure of the isthmus to 1,330 mgm. of radium, the two nodules vanished promptly and she no longer experienced the

TABLE I

Radium Therapy of Thyrotoxicosis

Year	Author	No. of Patients	Results Good	Poor	Dead
1904	Abbe	1			
1913	Pinch	6	66.6%	33.3%	0
1914	Halstead	1			
1917	Burrows	79	80.1%	19.9%	0
1919	Turner	50	98 %	2 %	0
1920	Aikins	100			0
1920	Claggett	31	90.3%	9.7%	0
1922	Terry	33			0
1923	Butler	65	77 %		0
1924	Hagans	100	35 %	65 %	0
1926	Larkin	20	80 %	10 %	10 %
1927	Rose	40	65.1%	34.9%	0
1929	Loucks	500	96.4%	2.4%	1.2%
1931	Hogler	306	86 %	14 %	0
1931	Gudzent	700	94 %	6 %	0

feeling of oppression behind the sternum."

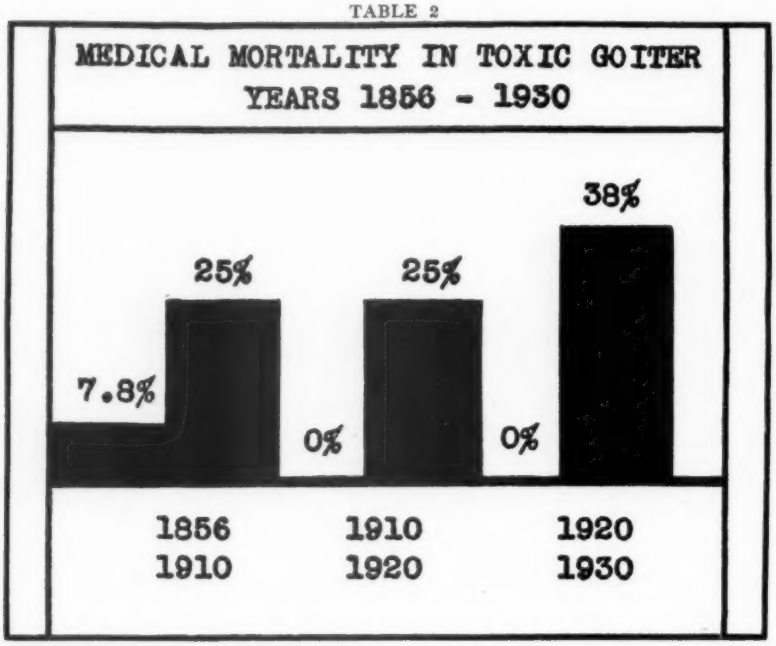
The first observer to report a large series of toxic goiter patients treated by external applications of radium was Aikins[19] of Toronto. During the years 1908 to 1920 he had treated one hundred patients with highly gratifying results. His experience was corroborated by Burrows,[20] Turner[21] and Clagett.[29] One of the most interesting reports, discussing the question of possible perithyroid adhesions following radium therapy, was published by Terry[23] of San Francisco, in 1922.

"Having had considerable experience in operating on goiters which had been treated with roentgen rays, we naturally feared that radium emanation might give rise to annoying adhesions between the thyroid and its surrounding structures, but we were pleased to find that they were minute points where the needle had entered the gland. . . . Of the fourteen patients that had resection of the thyroid after the radium treatment four died. . . . In two cases there had been an apparent cure by radium alone. In one the basal metabolic rate was plus 122 per cent before the introduction of . . . the radium emanation. Two months later his basal metabolism was plus 27.5 and four months later it was 12.9. The other patient had a basal metabolic rate of plus 84.4 before five tubes of radium . . . were introduced. Two months later his basal metabolism was plus 38 and four months following the radiation it was plus 5.7. He is now working as a stevedore and teamster, and seems fully recovered."

During the past ten years reports of the favorable action of radium in toxic goiter were published by Butler,[24] Hagans,[25] Larkin,[26] Rose,[27] Loucks,[28] Ginsburg,[29] Hogler,[30] Gudzent[31] and others. Their results are shown in Table I. The question of possible perithyroid adhesions after external radium therapy is discussed by Gudzent and Hogler whose experience covers 1,006 cases of toxic goiter. Gudzent obtained favorable results in 94 per cent of his cases and failed in four per cent, while Hogler met with good results in 86 per cent of his cases. In the small number of patients that came to operation after radium treatment the surgeon met with no special difficulty because of the previous irradiation. My own experience with radium therapy in toxic goiter parallels that of Hogler both in results and surgical experience. I have watched carefully at operation three of my patients who had received previous radium therapy and in none of them did the surgeon find the feared perithyroid adhesions.

Radium Technic. Our technic has been modified considerably since 1925, when we began to have access to a large number of toxic goiter patients. For the past three years, with little variation, it has been as follows: We use the radium collar usually at 3 cm. distance. This collar is made up of 5 blocks of balsa wood, each block measuring 5 by 3 by 3 cm. The blocks are held in place by means of adhesive plaster. Their proper adjustment to the neck is obtained by pledgets of gauze. Each brass capsule, 1 mm. thick, contains from 10 to 25 mgm. of radium in the form of steel needles, according to indications. The collar is strapped in place by adhesive plaster and reinforced by a bandage; 6,000 mgm. hours constitute a mild erythema dose, if given within ten days to two weeks. We have found that we get our best clinical results by fractionating our dose and increasing the total to 9,600 mgm. hours given within four weeks.

TABLE 2



This dose is followed by a fairly marked erythema which subsides within two to three weeks after the application of the full dose. At the end of the skin reaction a complete clinical and basal metabolic study is made. If definite evidence of toxemia persists the course is to be repeated. In resistant cases we have administered three, four and even five courses of treatments at proper intervals without any ill effects upon the skin or underlying tissues.

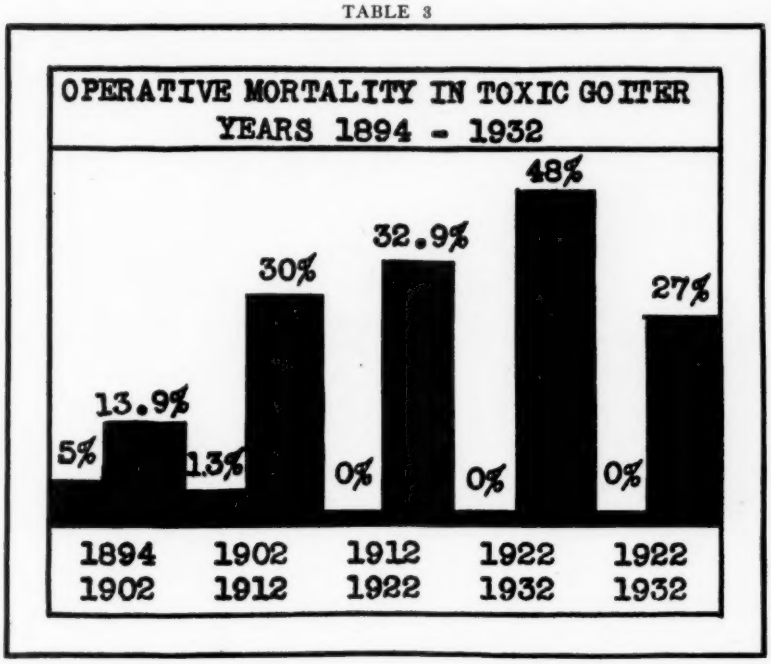
In a few cases with bulky thyroid enlargement we utilized a radium collar at 4 or 6 cm. distance. This increases the depth dose at 3-5 cm. by ten to twenty per cent. Our erythema dose for a single course was then correspondingly increased to 14,000 mgm. hours at 4 cm. distance and 20,000 mgm. hours at 6 cm. distance.

Results. Our results have varied with the severity of the case treated and the number of treatments carried out. In the milder cases a single course usually suffices to get a good clinical result. In 15-20 per cent of our cases clinical cure was obtained by a single erythema dose or course. In the moderately severe cases, which constituted between 60-70 per cent of our cases, two and occasionally three courses were required to obtain a cure. In five to ten per cent of the very severe and long standing cases more than three or four courses were required. Occasionally, however, we were very agreeably surprised to find a very prompt and satisfactory response to a single course or erythema dose in a very severe case, where we had stressed to the family that prolonged treatment with radium may be required to produce a cure. However, experience has taught me that it is best to impress upon the family or patient that a single course of radium is not always curative and that more than one course of radium may be necessary. Our failures have occurred mainly in cases where patients refused to have more than one or two courses of radium treatments. It is in this small group that surgery was later resorted to.

Radium Versus Surgery

Our results of radium therapy in toxic goiter have been very gratifying. They have ranged between 85 and 90 per cent in our entire group of toxic cases. We have always combined careful medical management and symptomatic drug treatment. However, the more experience we gained in the treatment of the various types of toxic goiter the more we have been impressed that proper selection of cases must be made and that some cases are better suitable for surgical treatment than treatment by physical agents, either roentgen rays or radium. I believe that the best therapeutic results in the local treatment of toxic goiter will be

TABLE 3



obtained if the following guiding principles are utilized in the selection of cases for treatment. Radium therapy is indicated in:

1. Borderline, mild or larval cases.
2. Early cases.
3. Cases with slight thyroid enlargement.
4. Average case without compression.
5. Postoperative persistent or recurrent cases.
6. Very severe cases without compression who refuse operation.
7. Poor operative risk cases.

Surgical Therapy is indicated in:

1. Cases refractory to judicious and efficient radium therapy.
2. Cases with compression phenomena.
3. Severe cases demanding quick economic restoration.
4. Cases with large adenomatous long standing goiters demanding perfect cosmetic results.

Report of Cases

CASE 1. — A young man, aged 24, came under my observation in August, 1931, complaining of symptoms of toxic goiter of eight months' duration.

In December, 1930, without any apparent predisposing or exciting causes he developed irritability, nervousness, progressive loss in weight, tremor, tachycardia, palpitation, dyspnoea on exertion, sleeplessness, weakness and fatigability.

When first seen in August, 1931, he had lost fifty pounds in weight, from 180 to 130 pounds. He was extremely irritable and restless. There was no exophthalmos. His pulse was 100. The blood pressure was 120/50. His teeth were in good condition. His throat was negative. The thyroid gland presented a moderate diffuse enlargement, soft, elastic in consistency, freely movable over the neighboring tissues. Bruit and thrill were absent. The circumference of the neck through the 7th cervical vertebra and the mid-thyroid region measured 38.5 cm. The heart was not enlarged. The rate was 100. There were no murmurs nor irregularities. The lungs and abdomen were negative. Urinalysis and blood count essentially negative. Basal metabolism plus 25 per cent.

Diagnosis: Diffuse toxic goiter.

Course under radium treatment: — Eight fractionated doses with the radium collar at 3 cm. distance were given within a period of three weeks. The total dose given was 9,600 mgm. hours. The result was highly gratifying. Within ten days after radium therapy was started improvement set in. On the day after the last fractionated dose was given the patient, an instructor in civil engineering at New York University, was able to undertake his professional duties and go through his entire year's work without any interruption or difficulties. In May slight persistence of tachycardia and irritability made me decide to give him another erythema dose. Promptly his pulse and general condition improved. His basal metabolism was normal. His neck shrank to 37.5 cm., while his weight increased from 130 pounds to 155 pounds. When last seen, in July, 1932, he was enjoying excellent health.

CASE 2. — A woman of 35, with classical symptoms of Graves' disease and unilateral exophthalmos, first came under my observation, in March, 1925. Her symptoms had been present for six months.

She had been treated medically for a few months by rest in bed and internal medication without much improvement. Examination revealed an undernourished young woman. Pulse 132 per minute. Basal metabolism plus 48 per cent. Very slight diffuse enlargement of the thyroid gland. Rest of the examination essentially negative.

Course under radium treatment: — Following one course of radium treatments, totalling 6,000 mgm. hours, given within a period of four weeks, there was marked improvement in her symptoms and she was able to resume her household duties. In July, 1925, following an acute influenzal infection, she developed a recurrence of symptoms. These yielded promptly to another erythema dose of radium therapy. Towards the end of 1925 she was free from any subjective complaints and the basal metabolism was within the range of normal. A mild persistent tachycardia made me decide to give her another erythema dose of radium. Reexamination in the early part of 1926, found her entirely free from any complaints. There was still a slight persistence of the exophthalmos. She has been under our observation until a few months ago and has remained in excellent condition of health.

CASE 3. — A woman, age 28, first came under my observation, in May, 1926. Until the summer of 1925 she had always enjoyed excellent health. She had not been unduly emotional until the onset of her present illness, which began in July, 1925, without any apparent cause. First symptom noted was progressive loss in weight, followed by weakness, fatigability, enlargement of the neck, tachycardia, palpitation, dyspnoea on exertion and exophthalmos. She grew nervous and irritable and suffered from headache and sleeplessness. Examination revealed a well developed, somewhat undernourished young woman, presenting the classical picture of exophthalmic goiter. The face was flushed, the eyes moderately exophthalmic. All the other ocular signs of Graves' disease were present. The tongue was tremulous. The tonsils were greatly enlarged and congested. The thyroid gland was diffusely enlarged. The consistency of all the lobes was firmer than normal. Bruit and thrill were present and were most marked over the isthmus and right lobe. The circumference of the neck through the 7th cervical vertebra and the mid-thyroid region measured 37 cm.; transverse diameter 16 cm.; right vertical diameter 8 cm.; left vertical 7 cm.; thickness right lobe 5 cm.; thickness left lobe 4 cm. Pulse and heart rate 140 per minute. Blood pressure 140/60. Basal metabolism plus 62 per cent. Urine and blood examination essentially negative.

Course under radium treatment: — We regarded this patient as having a moderately severe form of Graves' disease and recommended a combination of rest in bed, symptomatic medical treatment and radium therapy. We could not, however, prevail upon this patient to carry out any rest treatment and were forced to treat her entirely as an ambulatory case. We started our radium therapy with a good deal of misgiving about our results but were very agreeably surprised to note improvement in symptoms within a few weeks after irradiation therapy was initiated. Within one month after the first erythema dose was given she was able to resume all her household duties. The circumference of the neck was reduced from 37 cm. to 34.5 cm. and the basal metabolism from plus 62 to plus 10 per cent. A moderate persistent tachycardia in spite of low basal metabolic rate made me repeat the course of radium treatments in the next few months with very gratifying results. Examination in February, 1927, showed complete recovery. The pulse and basal metabolic rate were normal. The exophthalmos completely receded. The circumference of the neck was reduced from the original 37 cm. to 32.5 cm. She has since gone through two normal pregnancies and delivery of full-termed normal children, and has shown no recurrence of Graves' disease.

CASE 4. — Postoperative persistent exophthalmic goiter in a girl, aged fifteen and one-half. This patient first came under my care in June, 1926. Four months after operation by a prominent thyroid surgeon her thyrotoxic symptoms persisted practically unchanged. At this time she was examined by the attending surgeon who had operated upon her. He suggested a trial with irradiation therapy and reoperation in case physical agents failed to control the disease. Under four courses of erythema doses of radium therapy she made a complete recovery. She was last examined a few months ago and found to enjoy perfect health.

CASE 5. — Postoperative recurrent toxic adenoma with compression phenomena. This patient, aged 48, was first seen in December, 1926. She presented a diffuse and nodular enlargement of the thyroid gland, which had recurred eight years after operation. There was definite compression in the mediastinum, as evidenced by the dilated veins over the neck and *manubrium sterni*. The pulse rate was 124 per minute. Basal metabolism plus 58 per cent. Following two courses of erythema doses of radium therapy there was complete relief from thyrotoxic symptoms and local compression phenomena. The neck shrank from 34.5 cm. to 32.5 cm. When last heard from, in 1931, she was still enjoying good health.

CASE 6. — Postoperative recurrent exophthalmic goiter with auricular fibrillation. Mrs. S. M., aged 43, was referred to me for radium treatment in May, 1930. Three years before she had undergone subtotal thyroidectomy for classical exophthalmic goiter with auricular fibrillation. A few months after the operation improvement set in and for nearly a year she enjoyed fair health, although the auricular fibrillation never disappeared completely. In the summer of 1928, gradual recurrence of thyrotoxic symptoms set in. In spite of general good care and medical treatment very little improvement was noted. In the early part of 1930 she rapidly began to lose weight. The fibrillation became more rapid and the basal metabolism registered plus 60 per cent. She was very restless and irritable and depressed. She was reexamined by her attending surgeon and he refused reoperation and suggested radium therapy.

Course under radium treatment: — Following the first course, or erythema dose, of radium therapy there was definite improvement in constitutional symptoms and shrinkage of thyroid. After the second course of treatments the patient was able to

leave her bed and attend to some of her domestic duties. But her fibrillation still persisted; hence, a third course of radium therapy was given. The result was very gratifying. In addition to almost complete disappearance of subjective complaints and a drop in basal metabolism from plus 60 to plus 20 per cent, the auricular fibrillation disappeared. Under date of November 25, 1930, the patient writes: "Both mentally and physically I am quite a different person, better in all ways than I have been in the last fifteen years. The attacks of morbidity have wholly disappeared. I am happy all the time, well-balanced and entirely free of the nervous irritation that was so acute and so very distressing." One year later I was informed by her attending physician that the patient has had no recurrence of distressing symptoms.

CASE 7. — Severe case of exophthalmic goiter refusing operation. Miss A. G., aged 16, was first seen in September, 1929. Her past history was essentially negative, except for an attack of small-pox at the age of two years.

Present Illness. — At the age of 13 years, in 1926, she noticed an enlargement of the thyroid gland, which slowly and progressively increased in size and was accompanied by nervousness, weakness, tachycardia, palpitation, dyspnoea on exertion, marked tremor, excessive sweating and loss in weight. She was treated medically with very little improvement until April, 1929, when tonsillectomy was performed with the hope of eradicating possible foci of tonsillar infection as the underlying cause of the toxic goiter. To the disappointment of both patient and physician all the toxic symptoms increased in severity after the operation, and the goiter grew more rapidly in size.

When first examined by me in September, 1929, she presented a marked case of diffuse and nodular toxic goiter. Her face was flushed, the entire body tremulous, the eyes showing definite stare and exophthalmos. The thyroid gland showed a diffuse enlargement and one discrete oval mass in the region of the right lobe. The superficial veins over the enlarged thyroid lobe were moderately dilated. There was a definite bruit over the entire gland. The circumference of the neck through the 7th cervical vertebra and the mid-thyroid region measured 38 cm.; the transverse diameter 17 cm.; the vertical diameter 8 cm.; the thickness of the right lobe 4 cm.; that of the left lobe 2 cm.

The heart showed enlargement on physical and roentgen examination. The rate varied between 140 and 160 per minute. Murmurs and irregularities were absent. The blood pressure ranged between 160 and 180 systolic and 40 to 0 diastolic. Lungs and abdomen were negative. There was marked tremor of the extended fingers. The palms were very moist. The hand grip was very feeble. Blood and urine examination revealed no abnormal findings. The basal metabolism showed plus 97 per cent.

Diagnosis. — Diffuse and nodular or adenomatous toxic goiter with slight compression.

Course under radium treatment: — Following one course of radium therapy given in fractionated doses with the radium collar at 3 cm. distance, there was marked improvement in constitutional symptoms, a drop in basal metabolism and a gain of 35 pounds in weight — from 100 pounds to 135 pounds. The circumference of the neck shrank from 38 to 34 cm. Under two more erythema doses of radium therapy, given during the summer and fall of 1930, complete clinical recovery took place. The pulse rate came down to 72 per minute. The basal metabolism dropped from the original plus 97 to plus 10 per cent. The systolic blood pressure dropped from 180 to 120 and the diastolic pressure rose from 0 to 80. Reexamination, in January, 1931, showed a marked transformation in personality, general appearance and facial expression. The stolid, scared animal expression was gone, and was replaced by the smiling features of a happy young girl, pleased with life and enjoying perfect health.

The patient was last seen in June, 1932, and found in excellent condition of health and no evidence of Graves' disease.

CASE 8. — Severe, poor surgical risk case of exophthalmic goiter refusing operation. Mrs. A. B., aged 55, was first seen in October, 1929. Until the onset of her present illness she had always enjoyed excellent health and had shown no manifestations of emotional imbalance. Suddenly, without any apparent cause, in the summer of 1925, she developed weakness and undue fatigability. Several weeks later, while walking in the street, she experienced a severe attack of retrosternal oppression, accompanied by dyspnoea and faintness. Immediate examination by the family physician revealed the presence of high blood pressure as the only apparent abnormal physical finding. Hence, a diagnosis of essential hypertension was made and treatment directed accordingly. Within one week she felt sufficiently improved to resume her former duties as housewife. A month or two later she had a recurrent attack of retrosternal pain and faintness. A diagnosis of primary cardiovascular disease was made and medical and rest treatment prescribed. The improvement this time was rather tardy, incomplete and temporary in duration. Gradually and progressively, she noticed the development of the following train of symptoms: weakness, fatigability, attacks of faintness, loss in weight, irritability, palpitation, tachycardia and dyspnoea on exertion.

With strength gradually waning she struggled along for the next two years, until the summer of 1927, when the shock of the death of her husband resulted in a sudden, severe exacerbation of all her symptoms. Repeatedly she sought the aid of medical consultants, but the diagnoses were doubtful and the various remedies prescribed failed to check the downward course of her health. Not until the spring of 1929, or nearly four years after the onset of her first symptoms, did the discovery of thyroid enlargement and exophthalmos lead to a diagnosis of exophthalmic goiter.

She was promptly admitted to a large hospital in New York, where she was treated medically for several weeks without any improvement. Thyroidectomy was then urged as the only means of relief. She refused any operation intervention and left the institution to receive a course of x-ray treatments elsewhere. The result was moderate improvement in constitutional symptoms without any

reduction in the size of the thyroid or any change in the ocular signs. She was then sent away for four weeks to the country for further recuperation and there suffered a relapse in symptoms and a further reduction in weight — to 86 pounds from an initial best weight of 185 pounds at the beginning of her illness.

She returned to New York in August, 1929, and was promptly readmitted to hospital, where again medical treatment was carried out without any improvement. In September her weight dropped to the low level of 71 pounds. Again thyroidectomy was urged as the last resort against an apparently fatally progressive illness. The patient categorically refused any surgical intervention and left the institution to be admitted to Beth Israel Hospital on October 16, 1929.

Examination on admission revealed a markedly emaciated, elderly woman, suffering from a severe grade of late exophthalmic goiter. Her skin was deeply bronzed as in Addison's disease. The eyes showed bilateral exophthalmos, the left more marked than the right. All the other ocular signs of Graves' disease were present. The thyroid was diffusely enlarged. Its consistency was firmer than normal. Bruit and thrill were marked. The circumference of the neck through the 7th cervical vertebra and the mid-thyroid region measured 29.5 cm. Heart enlarged on physical and roentgen examination. The rate was 120 per minute but regular. Electrocardiographic studies revealed definite myocardial damage. Blood pressure readings varied between 190-170/70-60. Blood examination showed moderate secondary anemia. Urinalysis was essentially negative. Basal metabolism plus was 67 per cent.

Diagnosis: Severe exophthalmic goiter with hypertension, myocardial and probable adrenal damage.

Course under medical treatment: — Following a period of two weeks complete rest in bed, high caloric feeding and medication, no improvement was noticed. At the request of Dr. David Robinson, on whose service the patient was admitted, radium therapy was started on October 29, 1929. Following a very small dose of highly filtered gamma rays of radium with the radium collar at 4 cm. distance, the patient developed an attack of auricular fibrillation and vomiting. She was promptly digitalized and the fibrillation stopped. After the second small dose of radium fibrillation recurred. We were now confronted by a very grave problem. The patient categorically refused any operation. Moreover, she was an extremely poor operative risk. If very small doses of radium therapy were followed by severe toxic symptoms, what other form of special therapy offered any promise of relief? Iodine therapy? But iodine is usually only of temporary benefit in the severe types of exophthalmic goiter. Those who have had the most experience with this therapeutic agent in Graves' disease stress the fact that it is to be used only as a preparatory measure to operation. Used medically in severe cases as a curative agent it may aggravate all the symptoms after its initial favorable effect.

However, it occurred to me if iodin is used as a temporary detoxicating agent to forestall postoperative thyrotoxic crises with their frequently fatal issue, why not use iodin as a preparatory measure to radium therapy in severely toxic cases? Accordingly, the patient was given compound solution of iodin one minim three times daily. The result was much more gratifying than we anticipated. Four days after the iodin administration was started the patient felt less toxic and a dose of radium which formerly was followed by marked toxic symptoms was now well tolerated. The doses of radium were rapidly increased in strength and frequency without inducing any constitutional reaction. She stood the treatments well and began to show progressive improvement. On December 23, 1929, the dose of Lugol's solution was reduced to one minim once daily and on January 4, 1930, it was stopped entirely. Unfortunately, on January 10th she developed an acute naso-pharyngitis with herpes labialis. This was followed by an exacerbation in her toxic symptoms. However, we felt that immediate resumption of iodin would be undesirable even though it might result in temporary benefit. We persisted in radium therapy unaided by any further recourse to iodin. After the first erythema dose of radium therapy the patient improved considerably and gained about ten pounds in weight. Under further radium therapy she made a full clinical recovery about the end of 1930. She was reexamined in the summer of 1931. She had gained fifty-four pounds in weight. Her pulse and basal metabolism were normal. The skin had lost its bronzing color. The patient felt entirely well. Her blood pressure, however, still registered 180/80. When last heard from in the early part of 1932, she was still enjoying good health.

Summary and Conclusions

Under the term toxic goiter are included all types of non-malignant goiter associated with tachycardia, tremor, wasting, increased basal metabolic rate, nervous and mental manifestations, with or without exophthalmos.

Clinically, the following three main groups are recognized: 1. Diffuse Toxic Goiter. 2. Nodular or Adenomatous Toxic Goiter. 3. Nodular and Diffuse Toxic Goiter.

Pathologically, no fundamental distinction is recognized among the various types of toxic goiter. They are all looked upon as mere variations of a single disease. In primary diffuse toxic goiter the entire gland is usually involved in the pathologic process, while in nodular goiter, discrete areas are involved with intervening healthy tissue between the affected areas.

In the pathogenesis of primary as well as secondary Graves' disease, a definitely diseased thyroid gland plays a predominant and central role. Hence, in addition to general supportive and symptomatic measures

and removal of foci of infection, local treatment directed towards the thyroid is of paramount importance.

The etiology of Graves' disease still remains unknown. We know some of the predisposing and precipitating or aggravating causes, but we are completely ignorant of the underlying basic cause of the disease.

Medical treatment in Graves' disease, although merely symptomatic and supportive, has yielded good results in many mild and some moderately severe cases. In the majority of severe cases it has failed to produce curative results. The mortality of mere medical treatment of severe cases of thyrotoxicosis has been recorded as high as eleven, seventeen, and thirty-eight per cent, in the experience of different observers.

Surgical treatment, in spite of improvement in technic and preoperative use of iodine still carries a mortality ranging between 0 and 27 per cent. Nor does recovery from the operation mean always complete clinical cure of the disease.

Radium therapy judiciously and efficiently applied may yield as brilliant results as or even more brilliant results than surgery without its attendant mortality and postoperative complications. To obtain such results proper selection of cases must be made. The types of cases in which radium therapy is indicated are: (a) borderline, mild or larval cases; (b) early cases; (c) cases with slight thyroid enlargement; (d) average case without compression; (e) postoperative persistent or recurrent cases; (f) very severe cases without compression who refuse operation; (g) poor operative risk cases. In addition to proper selection of cases, to obtain the best results, radium therapy should always be combined with judicious medical management.

Surgical therapy is indicated in: (a) cases refractory to judicious and efficient radium therapy; (b) cases with compression phenomena; (c) severe cases demanding quick economic restoration; (d) cases with large, long standing, adenomatous goiters demanding perfect cosmetic results.

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Discussion

Dr. Israel Bram (Philadelphia, Pa.): Any measure that reduces the surgery of Graves' disease is highly welcome.

Goiter is more prevalent than is generally believed. There are fully six million sufferers from goiter in this country alone. One-third take their chances with erring nature and neglect themselves. Another third do worse by resorting to quack remedies and to iodine — a drug of limited use in prevention but dangerous as a cure. The remaining two million sufferers seek legitimate medical aid.

Our first task is proper discrimination of thyroid swellings. The lump may be an old-standing thyroid tumor requiring the knife, comprising 50 per cent of all goiters. Such a goiter may become toxic and require calming down as a preliminary to safer surgical treatment. Here is where radium or x-ray combined with appropriate medical treatment steps in. The remaining 50 per cent are non-tumor goiters comparable to a distended sponge and are local expressions of bodily conditions requiring non-surgical management.

The most important among non-tumor or non-surgical goiters is that tragic condition implicating every inch of the body — exophthalmic goiter or Graves' disease. Surgery may temporarily improve these patients, but their future is insecure unless treatment includes efforts to overcome the many problems afflicting the individual as a whole.

Those susceptible to exophthalmic goiter are by heritage high-strung, emotional and sensitive to nervous shock. They are an interesting type of humanity, giving to the world many artists, writers, musicians, painters, and leaders of men. Herr Stressemann, the great leader of post-war Germany, was already afflicted when in the height of his career, but too busy with affairs of state to care for himself, gave his life for his country. Mere susceptibility, however, is an unconscious quality, typifying but not incapacitating the individual. The expert can recognize the earmarks of susceptibility and may suggest measures in the protection of the individual's future.

The most striking element in the causation of exophthalmic goiter is the psychic factor. In a study of 4,300 cases, I elicited a history of nervous shock in over 90 per cent. The heart hurry, emotionalism, swollen neck, bulging eyes, trembling and rapid emaciation occurred shortly after the incidence of intensive overwork, worry, death of a loved one, an accident or other event in which the nervous system received a staggering impact. During the World War thousands of our boys were sent back from the firing line with exophthalmic goiter. The financial depression, too, has shocked many susceptible persons into this malady. Incidentally, the disease may result from the dangerous self-drugging of some women who aim at a "sylph-like" figure.

Exophthalmic goiter is usually due to the maladjustment of the individual to environment and of environment to the individual. Treatment must therefore be directed to the individual as a whole, and must include a consideration of diet, medicaments, sleep, work, play, social, sexual and mental habits, and possibly an alteration of the individual's definition of happiness. Radium and x-ray treatment in selected cases constitute but one phase — a supplement, within a far-reaching régime of attention. Psychotherapy, essential to cooperation, must aim at correction of discoverable faults, foibles and vicious circles characterizing physical and mental existence.

The temptation to stand pat on any one form of treatment is strong. We must ever retain an open mind for something better, since no mode of treatment of disease can be regarded as the last word. This is especially applicable to goiter, more particularly to exophthalmic goiter. Surgery, radium, x-ray, medicinal measures including iodine, each can be used and abused — each is capable of good and of harm, depending upon the physician's discrimination in the selection of his cases and of his remedies. In exophthalmic goiter, rather than the lump on the neck, it is the sick individual that requires our attention. This is a complex and time-consuming problem, but it is the study of humanity, and what study is more worth while?

Taught how to eat, how to sleep, how to work, how to play, and even how to think, such a patient, managed as indicated, becomes and stays well. Intensive study of this subject by the profession should, within the next decade or two, greatly reduce the number of sufferers from thyroid disease in our land. (Applause.)

Dr. A. E. Perley: In November, 1930, I attended the meeting of a medical club in New York City at which time Dr. Ginsberg read a paper on Radium Treatment in Goiter and demonstrated several patients. The next forenoon I spent in his clinic at his kind invitation.

My interest was first aroused in this work while a student in the Graduate School at the University of Pennsylvania, where Dr. Pfahler was achieving some remarkable results through the treatment of toxic adenoma with x-rays. In my two years there I saw many cases yield to that form of treatment. In a paper presented before the Bronx County Medical Society, in March 16th, of this year, Dr. Pfahler made the following statements:

"Surely equally good results can be obtained with radium as compared with x-rays.

"After all the final results are what count. The general report is that about 65 per cent became symptom free and remain well. Approximately from 15 to 20 per cent more are improved and from 10 to 20 per cent do not improve. The results obtained by irradiation are equal to those obtained by surgery, with less shock or risk to the patient."

The attitude of many surgeons is distinctly hostile to radiation therapy of any form. Internes on the

surgical service of many hospitals are instructed never to permit any of their goiter patients to be treated by irradiation. Such an attitude is expressed by Richter, of Chicago, in the March number of *Radiology,* 1932. "The evidence presented showing the value of radiologic treatment of thyrotoxicosis is faulty because of the failure to present adequate pre-operative and post-operative studies of the patients treated. The immediate mortality with radiologic treatment, while low, is misleading in view of the shortening of life expectancy with the incomplete relief from the thyrotoxicosis which may occur in many of the cases."

If one will follow the case reports obtainable in Dr. Ginsberg's clinic or from Dr. Pfahler's records one would realize that Dr. Richter's statements are distinctly misleading. Yet, the *International Medical Annual* for 1932 gives an adverse opinion of the results of radiation therapy as the direct results of Dr. Richter's statements.

In *Radiology* of March, 1932, Dr. Menville states: "MacLean, in 1921, made a survey to ascertain the surgical mortality in exophthalmic goiter, sending questionnaires to 100 American and Canadian hospitals. The replies indicated that a mortality rate of 8 per cent existed at that time. Some time later, he sent questionnaires to 200 additional hospitals, and obtained about the same percentage, the mortality rate being then 7 per cent. In 1929, Cooke stated that there was a general increase in surgical mortality rates during recent years, and that thyroid surgery headed the list, with a mortality rate which had increased 250 per cent in the preceding two decades. He believed the reason for this increase to be that every local surgeon today operates on goiter cases, while several years ago operation was done by only a few experts."

Dr. Ginsberg is to be congratulated that he can reach these patients. For many of us seldom get a chance to treat a goiter case of any kind by radiation, so great is the influence of the surgeon.

Dr. J. E. Gendreau (Montreal, Canada): I would like to ask the filtration and surface. That is all.

Dr. Solomon Ginsburg (closing discussion): When I started to work on this phase of the problem with radium, some eight years ago, I used an ordinary block 3 x 7 centimeters x 3 thick. I applied it to each lateral lobe of the thyroid and over the thymus region. Later on, I converted it into a collar and found that if I used such a collar and gave the patient 6,000 milligram hours at 3 centimeters distance, equivalent to 2 millimeters of brass filtration, I obtained a fairly marked erythema dose. I found, however, if I increased the time factor from 6 or 7 days to 3 or 3½ weeks, I could increase the dosage from 9,000 to 10,000 milligram hours and obtain better results.

The surface area of the collar is 5 x 15 — 75 square centimeters. Each block is composed of balsa wood, measuring 5 x 3 x 3 centimeters. Five such constitute a surface area of 75 centimeters. In giving the patients, therefore, 9,000 milligram hours, you are giving the patient a little bit more than 100 milligram hours of radium to a square centimeter. That is a very safe dose to give. I feel that you could give double the amount of dosage without very much danger at all.

One more word. Dr. Bram correctly expressed the importance of psychic factors and social and economic conditions. I happen to take care of patients in a clinic where people are in very poor economic conditions, as a rule. We cannot do more than administer the radium and advise the patient how best to take care of themselves. In spite of many disadvantages they often show remarkable results. Hence, I am inclined to believe the thyroid condition in itself plays a primary and predominant rôle. While I have stressed, and stress again, the importance of all medical measures, all types, including psychotherapy, still I feel that in radium we have a local and very powerful therapeutic agent of great potentiality when intelligently applied in selected toxic goiter patients.

RECENT ADVANCES IN THE DIATHERMIC TREATMENT OF PNEUMONIA *

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The first report of a series of pneumonia cases treated by diathermy, was published by the writer in October, 1922. The successful results of this early work in the U. S. Marine Hospital, Number 21, New York, led to a clinical study with control cases. These, with several series in private practice, were reported in the first text on this subject in 1923. A paper by the writer, read before the Section of Electrotherapeutics of the Royal Society of Medicine, in London, 1926, was printed in the "Proceedings" that year. Interest aroused in this technic was evident throughout Britain and its colonies with many series of treated cases reported. It was not until 1928 in a paper read before this society that the writer made any claim for a lessened mortality under diathermic treatment.

In the last few years fifty-one articles by the writer and his colleagues have appeared in the literature. Fifteen recent texts on physical therapy in English and German, have devoted space to the elucidation of its technic. The first bibliography on the subject of diathermy in pneumonia is appended to this paper for the convenience of those who might desire to go deeply into the subject.

Although, naturally, a close student of the subject, the writer must confess his surprise at the amount of work that has been reported. From this, it may be confidently stated that we have passed the experimental stage in the use of diathermy in the treatment of pneumonia. It is being widely employed in Government and General Hospitals, both here and abroad. This growth, slow at first, has increased constantly with greater knowledge of the clinical results obtained with diathermy.

Clinical Effects

Although the symptomatic results have been described many times, it might be well briefly to restate them for the convenience of the reader. During and following the treatment there is a noticeable lessening of cyanosis, pain, improved respiratory function and heart rate. Sleep is augmented and the patient becomes mentally brighter and more hopeful. In 95 per cent of all treated cases the temperature falls by lysis. Of course, not all of these results are obtained in any one case. The change brought about, in the characteristic temperature drop by lysis, is the most striking single result of the treatment. It means conservation of the patient's energy. The lower pulse rate which is also a sequence, provides longer rest periods for the overworked and toxic myocardium.

The mortality figures, in my own series, have fallen to 11.9 per cent. Several other clinicians have surpassed this figure. Notable records in mortality reduction have been reported by those in charge of the work in some of our largest hospitals, such as Walter Reed and St. Elizabeth's, in Washington. That about 70 per cent lessened mortality is possible in the average run of cases, is no longer in doubt. Much better results than these are obtainable where treatment can be instituted in the first forty-eight hours. It is my prediction that a death rate of less than 10 per cent will be reached when early and adequate treatment is more generally available.

Technic

In our early experience with the technic we made several errors, all of them, fortunately, on the side of conservatism. Our first hospital cases received treatment but once, or at the most, twice, daily. Dosages ranging from 1200 to 1800 ma., were the rule, applied through 5 by 7 inch electrodes, in single lobe involvements. In the presence of empyema, or extreme degrees of hypotension, treatment as outlined above was discontinued.

* Read at the Eleventh Annual Session of the American Congress of Physical Therapy, X-Ray and Radium, New York, Septemer 6, 1932.

Present Technic

The assignment of a special technician on a case now permits of more frequent treatments. Since the various symptomatic improvements, before mentioned, are limited in their full effect to about three hours, it is obvious that to maintain maximum gain, treatment should be repeated at about that interval. It is well to omit one or two late night treatments from this three-hour schedule, if the patient's condition permits. When the patient shows some gain following each diathermy treatment, but is gradually becoming more critically ill, one should apply treatment even more often. Hourly treatments, alternate hours, have been given in several cases with gratifying results. Several writers, particularly Tarbell, have pointed out the value of intensive treatments early in the disease. From 2000 to 3500 ma., are used by some. In general it can be said that the best results in serious cases lie in the intensification of dosage. What the maximum is, we do not yet know. On the other hand experience has taught us that a patient who shows absolutely no improvement after the third treatment, presents an almost fatal prognosis.

The size of electrodes chosen is now considerably larger than those we used at first. The obliquity of the interlobular septae, makes it almost impossible to reach all of an involved lobe with small electrodes. Since we have included with larger electrodes, not only the involved area, but well beyond it in all directions, the instances of extension of pneumonia have become almost negligible.

Empyema had been reduced in our series to about 40 per cent of the average number to be expected. Diathermy was discontinued in the early cases because of the fear of disseminating the infection. We now feel sure that such fear was groundless, in view of the strong limiting action of the pleural wall. This complication usually occurs late in the course of the disease, when one or two more days of treatment would terminate the pneumonia. The empyema is treated exactly as though diathermy were not being given. Seldom, however, is rib resection necessary.

Hypotension is not a very serious complication when the patient can be kept at rest. We now pay little attention to it, and do not modify the diathermy program in the slightest degree.

In addition to the problem of dosage intensification, our attention has been focused recently on the behavior of the heart in pneumonia. Most deaths in this disease are those from cardiac failure. The striking improvement in the patient's color and pulse, so uniformally experienced under diathermy treatment, certainly indicates a favorable effect upon the heart. Exactly how this occurs cannot yet be explained except on theoretical grounds. It has seemed to me that one or more of the following factors accounted for the changes so clearly discernible in the average case.

1. Where pleuritic pain limits the amount of respiratory excursion, the sedative effect of the heat would allow a great increase in the tidal air intake.

2. There is probably a quickening of the circulation *around* the area of actual consolidation, which decreases the amount of passive congestion.

3. The coronary blood supply may be augmented sufficiently to bring about improved nutrition to the fatigued and toxic myocardium.

4. Direct stimulation to cardiac ganglia may account for some of the improvement noted.

5. Whenever the temperature is lowered there is a proportionate lowering of pulse rate.

In summing up the effect of diathermy on the heart too much stress cannot be laid on its importance. The more thready and irregular the pulse, the more striking, as a rule, is the improvement following treatment. If the entire heart does not lie in the diathermy pathway, it is often advisable to give alternate treatments to the heart. In any case where the heart has been seriously embarrassed during the course of the disease, we now continue cardiac treatment for several days after resolution is practically complete. This procedure was instituted following the death of several such patients from cardiac failure during the first week of convalescence, and after pulmonary diathermy had been discontinued.

The only contraindications to diathermy

in pneumonia, are advanced pulmonary tuberculosis and too rapid resolution with signs of toxic absorption.

Summary

The treatment of pneumonia by diathermy is steadily gaining favor whenever it has been given an adequate clinical trial.

Clinical improvement sufficient to justify the employment of diathermy is attested to by every writer on the subject.

To obtain a mortality reduction from 19 per cent in our first treated group, (that for the controls was 42 per cent), to less than 12 per cent, it has been necessary to maintain an average of less than 10 per cent since our first 200 cases. Others have surpassed our results, indicating clearly that they depend only on good technical knowledge and not on the personal equasion.

Intensification of treatment, where improvement under it is shown, will bring still better results. A more general knowledge, on the part of the profession at large, of the great efficiency of *early* treatment, will still further lower the mortality figures.

We have, in the use of diathermy in pneumonia, a measure of the greatest value in the treatment régime of each case. It is time that we spread the knowledge of its value to our confrers, in no uncertain terms.

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Discussion

Dr. C. S. Stephenson (Commander, Medical Corps, U. S. Navy, U. S. Naval Hospital, New York, N. Y.): Mr. Chairman, it gives me great pleasure to be invited to speak on this subject of diathermy in pneumonia and confirm the facts that have been given to you by the essayist. Soon after his first work, I had the pleasure of reporting the use of diathermy upon a series of 114 cases with a mortality of 8.4 per cent. I do not like to claim this as a direct result of diathermy. I should like to qualify that by saying it might be the fact that we had a selected group of patients. It may have had something to do with the low mortality. But I do firmly believe that those of us who have failed to use diathermy in the treatment of pneumonia are failing to use a very effective measure. Unfortunately, in the larger hospitals, particularly in the military service, we have such a rapidly changing personnel, due to the fact that we are subject to orders which takes us to foreign lands, seas, or various institutions for post-graduate study, that we are prone to fall into the habit of believing that every new catch phrase in the line of new therapeutics is the thing that is curing our pneumonia. I never have believed that. The unfortunate position and in my opinion the reason that diathermy has not been universally accepted is because we have not ourselves done a sufficient amount of what the ultrascientific individuals are pleased to call control work. I should like to urge upon all members of this society and other medical bodies that we seek opportunity to study our findings by means of control investigations under rigid supervision. It is my belief that with an equal amount of selection between the types of patients, we will then find a mortality ratio that will favor diathermy as a routine measure in pneumonia.

Those of us who go down to sea in ships and who come in contact with patients ill of pneumonia and have seen this method of treatment tried, feel that we are without a very important aid in saving the lives or at least making comfortable those people who are stricken while they are far away from the hospitals. I should like this very definitely, personally, if I should ever be ill at sea with pneumonia and there is a diathermy apparatus available, I should hold that man responsible who has failed to give me all that he could do in the method of relief if he does not give me diathermy.

Dr. Blonas: Dr. Stewart, in regard to children, pediatric treatment, would you in brief give me an outline of treatment with diathermy and whether it is as successful in children as adults?

Dr. T. A. Lehmann (Long Island City, N. Y.): Would diathermic treatment be of any avail whatsoever in alcoholic pneumonia?

Dr. Frank T. Woodbury (New York, N. Y.): I would like to ask Dr. Stewart if he has ever used diathermy as a preventive measure in the acute exanthemas such as measles, influenza, to prevent the possible bronchial pneumonia which so often follows.

Dr. Warshaw: Just what experience have you had, Dr. Stewart, with unresolved pneumonia?

Dr. Luther A. Tarbell (New Haven, Conn.): It is unnecessary to add anything to Dr. Stewart's paper. I heartily endorse everything that he has said. Dr. Stewart and I have cooperated in work. I obtained all my inspiration from Dr. Stewart in the first place and have had a few ideas of my own since then. I have had a large series of cases, quite a few hundred. I had many cases at the Battle

Creek Sanitarium who came in moribund, considered almost hopeless cases, who were restored to complete health by diathermy.

I have also seen many patients with early suspicious signs of oncoming pneumonia that were obviously relieved of a prolonged illness. For every one of the quite a few hundred cases of pneumonia I have treated, I have had five or six cases which seemed to me were potential pneumonias. Many of them start with chills and fever, the usual onset of pneumonia, and a great many of them had the severer symptoms controlled before we found either x-ray or physical signs following colds. I have been especially successful in my particular series in treating children. It has been tried by some very good pediatricians and they have not been successful, but in my experience it has been my outstanding work.

Dr. Emilio L. Hergert (Brooklyn, N. Y.): May I ask a question of Dr. Stewart? Suppose he had a patient so recalcitrant he objected to going to the hospital, or suppose our Mayor Walker refused to go to the hospital and Dr. Stewart was to treat him, how would he treat him — transport a machine? Suppose Dr. Stewart had to use the machine three or four times a day, would he stay and give the diathermy or have a special nurse trained in diathermy? In other words, let us have the treatment not only for our patients in the hospitals but for the patient that does not want to go to the hospital. How would you treat that patient?

Miss Menegay (Technician, Grand Rapids, Mich.): We have portable diathermy in the homes. The doctors can't take the time to give the treatments, but he can rely on a trained technician to go out and do that for him.

Dr. G. J. Warnshius (Milwaukee, Wis): Dr. Tarbell made a good point in regard to the course of pneumonia. It has been my impression, very much the same as Dr. Tarbell's, that there is a stage in the onset of pneumonia where there is very little exudate. You have the clinical symptoms, chills and fever. There is some dullness at the base, but you do not get the characteristic breath sound changes that you get with an advanced, established pneumonia. I am convinced that if diathermy can be applied to chest at that stage, which I would term the stage of congestion, that congestion can be relieved and many of these cases of pneumonia can not only be prevented from developing into a fatal termination, but can be aborted. That is not just a theoretical assumption on my part. I have done it and I have done it in cases which presented very grave symptoms.

There is just one question, Dr. Stewart, in regard to the question the doctor raised as to the voltage of the machine, is it possible to get good results with a low voltage machine?

Dr. Harry E. Stewart (New Haven, Conn.): closing discussion: As I said in the paper, quite a few clinicians and institutions have surpassed our figures and you see that in the Naval Hospital group that Dr. Stephenson spoke of. I am delighted at that. If you will think back, I know several other technics in medicine in which no one else has ever been able to duplicate what the inventor of the method, claimed. It is a great source of satisfaction where our figures have been surpassed.

The point regarding controls is a very good one. That is what gave us our start at the Marine Hospital. As I gave the figures in the paper, we had a very desperate series of cases that particular winter, with Type II and Type III predominating and our death rate in the controls was over 42 per cent and in the treated cases, 19.

We, too, have had very good success with children. There the point is to cover the entire chest, cut the electrode suitable to that child's chest in size, being sure the electrodes do not come too close together at the side or you will get more heating there than you want. Then raise the milliamperage up to about 25 per square inch. The average dose would be anywhere from 600 to 1,000 ma.

I do not know exactly what you mean by alcoholic pneumonia. If you mean ordinary pneumonia in chronic alcoholics, we certainly had them in the sailor group in the Marine Hospital. We not only had that, but about every other handicap they could have. That is where we thought we had a particularly hard group to deal with. Many of those men were also taken sick one, two, three, or four days out at sea and came in from the hold of the ship in bad shape.

In regard to prevention, the results were a death of 19 per cent as against 42 per cent in the same wards with the same nurses and the same treatment. Those were the days when we had a little rickety Wappler diathermy "on its last legs" and a technical staff so overworked that no case got over two treatments and usually only one in 24 hours.

Now the work of Dr. Portmann of the Cleveland Clinic has shown what can be done in prevention and that, of course, was in the line of post-operative pneumonias. Every patient with a rise of temperature was treated, and they have practically eliminated post-operative pneumonia there.

The point Dr. Woodbury brings up is a very good one, that of the same treatment in cases of measles and the like, where bronchial breathing develops and you are afraid of pneumonia. You will absolutely raise the resistance of the threatened lung with preliminary diathermy.

In unresolved pneumonia, the results are very good indeed. That is an ideal indication for it. There, of course, it should be carried on for quite a time, perhaps once daily.

In our series, I think running now about 811, we have only lost three that we got in the first 48 hours, emphasizing the point made by the last discussor about early application of treatment.

Very nearly all of our last 400 or 500 patients have been house cases. We have a number of portable machines in our clinic. A group of graduate nurses who want to specialize on this are given special work in the fall to get ready for it, and they go on the cases as special technicians and stay on the cases until the end. We should be very careful what we say about aborting pneumonia. I have seen it accomplished about twelve or fourteen times, but you know the old statement, "You had a touch of pneumonia; I pulled you out of it," and so forth.

Such statements are in bad repute, and justly so.

Dr. Tarbell has several very good x-ray pictures showing the congestion and showing it cleared a few hours afterwards, and clinically we think we have seen it, but I think the least we say about it and claim for it, the better.

Now about voltage. In my opinion, anyone of the standard portable machines today is sufficient to do serviceable work. Binger and Christie's studies at the Rockefeller Institute were not done with the high voltage machines. The thermocouples in the tissue showed the rise of heat. I believe any standard portable machine is efficient for the work.

BRONCHOCLYSIS *†

An Original Method for Prolonged Intrapulmonary Therapy

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Bronchoclysis is a form of direct intrapulmonary therapy. It should not be confused with bronchoscopic suction-irrigation of the lungs. It is the slow drop by drop instillation of fluid into the bronchopulmonary tract, made possible by the ability of the tracheobronchial canal to retain a catheter (a small rubber tube of fine caliber) for a comparatively long period of time after preliminary local anesthesia, and is dependent upon the physiological capacity of the rich pulmonary lymphatic system to absorb watery agents as well as particulate matter. This permits rather prolonged contact of antiseptic solutions with the surfaces of diseased pulmonary areas as well as flushing of the pulmonary lymphatic vessels.

In bronchial suction-lavage a considerable amount of fluid is introduced into the affected pulmonary area and simultaneously removed by suction. Credit is due to Lynah and Yankauer, as well as to Lukens, Moore and Funk[1] for much of the experience upon which the development of bronchoclysis is based.

For a thorough appreciation of this interesting physiologic function of the pulmonary lymphatics, most modern works on physiology offer a satisfactory description. Certain features concerning the mechanism of pulmonary absorption are, however, still mooted questions, and as we are particularly interested in the fact that fluids can be, and are, absorbed in the lungs, this knowledge serves as a basis for our present purpose.

In 1919, Winternitz and Smith[2] demonstrated upon dogs that the lung is much less susceptible to the introduction of fluid than was generally supposed. Repeated experiments demonstrated that the lungs can be entirely flooded through the bronchi with isotonic salt solution and that this process of irrigation can continue for at least two hours with the introduction of six liters of fluid without causing any evident harmful changes in bodily well-being or any subsequent serious microscopic lesions in the lung tissue. By means of the use of colored solutions it was shown that the fluid introduced, actually passes throughout the lung, bronchi, bronchioles, and alveoli and does not simply flow back through the trachea without entering the lung.

Subsequent research by the above mentioned and other investigators upon animals, which were previously inoculated with both attenuated and virulent cultures of various bacterial organisms, shortly followed by bronchial irrigation, showed rather serious results in the lungs of many animals.

In similar experiments conducted by me in humans these results were not duplicated, even in patients with tuberculous and nontuberculous suppurative conditions, in which both simple irrigations and suction-irrigation, with and without postural treatment, were used.

The reason for this seeming paradox and the comparative safety with which infected human lungs can be irrigated seems to be that the purposeful experimental inoculation of the lungs of animals, shortly followed by

* Read at the Eleventh Annual Session of the American Congress of Physical Therapy, New York, September 9, 1932.

† From the Bronchoscopic Department of the Hospital for Joint Diseases, New York City.

irrigation, prevents the natural protective mechanism of these sensitive tissues from quickly mobilizing. This artificial infection of the lungs of laboratory animals, whether followed by irrigation or not, presents an entirely different picture than that of properly introduced fluids in already infected human lungs. The deductions drawn therefrom are not borne out by experience of myself and others in the hitherto extensive use of suction-irrigation in non-tuberculous pulmonary suppuration. This includes thousands of intratracheal injections in every type of pulmonary infection including lobar pneumonia and phthisis, with laryngeal syringe, bronchoscope, and other similar means.

My observations that humans vary in their individual reaction to the same or different agents injected into the lungs, have been similarly noted by Winternitz, Smith and McNamara,[3] in 1920 in laboratory animals. In a series of experiments to determine the resemblance between the lesions of influenzal pneumonia and those produced by the inhalation of pulmonary irritating gases,[4] they showed that similar changes are produced in other species of animals, but that *"species differ in their resistance according to the acid and the concentration in which it is employed."* Further studies relating to the differences in the results of changes found in animals' lungs resulted in similar conclusions.

The original use of fluid intratracheal injections, which necessarily gravitated to more dependent portions of the lungs, according to chance or guided by postural changes of the patient, was a purely empirical procedure. With the improvement of laboratory methods, especially the study of those important biologic problems made possible through the use of laboratory animals and the advent of the x-ray, intrapulmonary therapy began to be placed upon a more rational basis.

A great many ill-founded deductions have been presented in the past ten years relative to the danger of spreading infection in suppurative pulmonary affections by the introduction of extraneous fluids, particularly in individuals with an infected lung on one side, and a healthy lung on the other. Such complications are apt to happen, very rarely, and then only in the active stages of pulmonary infection with high fever, chills, sweats, and other signs of sepsis. I have repeatedly shown both in animals and in patients suffering with purulent pulmonary infection, that under the fluoroscope, during a violent paroxysm of coughing, varying amounts of the previously injected iodized oil in one lung entered the opposite one. The same action is invoked with the bacteria-laden sputum of patients suffering with other pulmonary diseases, including tuberculosis, apparently without affecting the previously uninfected lung. It is thus apparent that the mere aspiration of infected material from an infected lung into the opposite lung or into uninfected portions of the same infected lung, does not necessarily result in an expansion of the disease process. It has been shown by workers in this field in both animal experience, as well as deductively in human subjects, that a solution of the continuity of the bronchial mucosa by trauma is necessary, in addition to the introduction of infected material into the bronchial passages, to produce pulmonary abscess. An exception is seen in blocking of the bronchial lumen, which, however, also more frequently than not, is overcome by the natural protective mechanism of respiration, viz., increased secretion, cilial action, cough and expectoration.

Anyone with an extensive experience with the simultaneous lavage and suction treatment of lung abscess and bronchiectasis, particularly where one has had the opportunity of observing a large number of the same cases over a period of years, is impressed with the fact that only in rare instances, if ever, can an extension of the infective process be attributed to the introduction of foreign fluids. In a previous paper,[5] in 1927, I stated that "the extension of 'draining' or 'drainable' abscess of the lung, simple or bronchiectatic, is limitable to the primarily affected areas, once drainage is established either by natural means, suction-irrigation, postural treatment, or surgical means."

Experience has shown one of the main sources of failure in direct intrapulmonary therapy has been the improper preparation of the patient, and in particular, the freeing of the bronchial channels of small calibre of thick, tenacious secretions, whatever the source. Bronchoscopic aspiration, gently

and thoroughly performed, ranks first in importance. This, however, can be made a much simpler step, if, preliminary to bronchoscopic aspiration, postural treatment is performed and if bronchoscopic suction lavage is deemed necessary. Even after this procedure, postural drainage still further helps to rid the bronchi of excessive fluid and secretion which otherwise would remain to prevent the remedial agents from coming into direct contact with the diseased area. The postural treatment frame shown in Fig. 1 offers an ideal method of supplementary bronchial drainage before applying endobronchial medication.

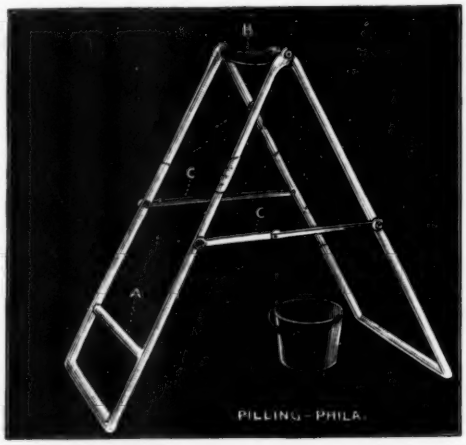

Fig. 1. Author's Postural Treatment Frame.

Darter,[6] Stitt[7] and others have used and advocated pulmonary irrigation through the bronchial catheter, in suppurative and non-suppurative pulmonary conditions even without the use of simultaneous suction, without causing untoward effects, although Chevalier Jackson, in discussing endobronchial medication in his recent work[8] states "Irrigation should be limited to a portion of the lung. Flooding of a large area of lung either by irrigation or by instillation of a considerable quantity of solution is contraindicated." Attempting the catheter method of pulmonary irrigation many years ago, I too came to a similar conclusion and, as stated elsewhere, feel that this method of irrigating the delicate pulmonary tissues is a haphazard and slip-shod measure. It was this very conclusion that led me to investigate the possibilities of bronchoclysis, or, as called by some, bronchial drip.

A careful study of medical literature pertaining to direct intrapulmonary therapy introduced into the trachea and bronchi through laryngeal syringes, tubular, and other instruments via the larynx, fails to reveal the report of a single instance of death due to the introduction of antiseptic isotonic aqueous solutions, directly attributable to this form of therapy. Watery agents are relatively innocuous and free from the danger of producing permanent pathologic changes in the pulmonary tissues.

The question of safety in injecting other than aqueous solutions, such as mineral and vegetable oils as well as the recent synthetic dyes and remedial agents in oil suspension, or oily solution, will not be gone into at the present time. Bronchoclysis, in this report is restricted to the use of aqueous solutions, as the dropping of oily medicaments into the nose, taken by the mouth, or intrabronchially injected, have on autopsy been shown occasionally to produce serious lesions in the lungs. The works of Corper,[9] in 1922, Loughlen,[10] in 1925, Pinkerton,[11] in 1927, MacCallum,[12] and Pierson,[13] in 1931, stimulated by Forestier[14] and others, who introduced the use of iodized oil as a bronchographic medium, are familiar to us all, and while of interest, have no immediate bearing, as this paper has only to do with the instillation of aqueous solutions.

No therapeutic or operative procedure, no matter how simple, thus far developed has been free from accidents and mortality. Even under the most perfect technic, normal obstetrics, still presents a distressing mortality. A single hypodermic injection of a minute dose of a foreign protein has caused instant death.

The remarkable freedom from unpleasant as well as dangerous results from the proper use of direct intrapulmonary aqueous instillations justifies a more general adoption. Of course, it must be applied intelligently and a thorough understanding of the necessary technic acquired by those essaying its use. It primarily remains within the domain of the laryngologist and bronchoscopist.

Various non-bronchoscopic methods of instilling fluids into the tracheobronchial tree have been in use for many years. The capacity of the lungs to tolerate foreign medicinal fluids was unknown until first used by Horace Green,[15] in 1838. It was not until 1853 that he established proof of his ability to inject medicaments between the vocal

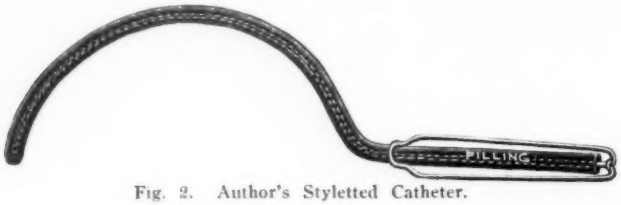

Fig. 2. Author's Styletted Catheter.

cords, down into the trachea and bronchi. He first introduced nitrate of silver solution into the bronchi by means of a small sponge fixed to the end of a flexible whale-bone shaft.

It is shown that the use of the bronchial catheter is not of recent origin, as Green states that in 1855, Marshall Hall, the English anatomist, during a visit to America, suggested to him the possible advantage of using a catheter for this purpose. He accepted the suggestion, and, utilizing a Hutching's flexible catheter, successfully injected solutions by means of a primitive syringe.

The catheter, while utilized for a time by others besides Green, fell into disuse, and laryngeal syringes became the vogue, which, for nearly seventy-five years, with numerous modifications, were, and still are utilized for making tracheobronchial injections. In 1922, following Forestier's[14] discovery of iodized oil, I suggested the use of the bronchial catheter for instilling this bronchographic medium into the lower air passage. (Fig. 2.) In 1924, Pilling, of Philadelphia, made a styletted bronchial catheter of my design which I have been using for this purpose ever since, and which I had the pleasure of demonstrating upon a patient to Dr. Forestier, at his request, during his visit to this city several years later. A subsequent study of the literature showed that not only had I been preceded nearly seventy-five years ago by Green in the use of the catheter, but that even the styletted catheter had been previously thought of and utilized by Darter[6] who, I found, in 1893 had already devised a styletted catheter for the same purpose as mine. The "oro-tracheal arc" utilized by me and conforming to the anatomic position of the head and neck while the catheter is being introduced, has a considerable advantage, at least in my hands, over Darter's. Since then, others have made use of the bronchial catheter with various other instrumental means of introduction as later devised by Darter,[6] Stitt,[7] in 1927, Garcia Vicente,[16] in 1928, Oughterson,[17] in 1931, and de Pablo,[18] in 1932. These may also be utilized. Soft or semi-stiff catheters which may be curved as desired and introduced with or without instrumental aid via the nose or mouth are used by others.

The stylet devised by me conforms in its curve to that later utilized in the reverse tracheotome, which was published in the Laryncoscope[19] in 1927. This particular curve, which was worked out on cadavers as well as upon living subjects, I termed the "oro-tracheal arc," as it permitted the easy introduction of instruments so shaped into the open mouth, then into the larynx between the vocal cords and down into the trachea to a depth on a level with the upper margin of the sternum. Subsequently, further studies in this direction led to the development of a series of pulmonary catheters, made for me by Eynard of Paris, through the co-operation of Bard & Co. of New York. The lung catheters are of different types: both radiopaque and non-radiopaque; soft and semi-rigid though flexible; straight and curved-tipped; short, medium and long.

Inasmuch as the use of the ureteral type of catheter must vary in length according to the location of the pulmonary lesion, it was found necessary to cut it, in each case, to a special length corresponding to the location of the lobe or lobule affected, and to the distance of the lesion from the proximal point of the catheter anchorage. As it is only recently that this additional step in the procedure was perfected, this part of the armamentarium is now being completed. I have not had time to include in the present article the illustrations intended to picture same. In another article, now nearing completion, which is to be published shortly, this step in the procedure will be gone into at greater length.

For the past three years I have been working with pulmonary catheters of the ureteral type, using No. 10 tonsil-snare

wire as a stylet. Their narrow calibre permits rapid introduction into bronchi of very small diameter, and an easier control of flow of aqueous fluids than is possible with larger calibered, soft rubber urinary catheters. These ureteral type catheters can be retained for periods of one to three hours without causing any distress to the patient.

For the purpose of bronchoclysis, this is the ideal instrument, particularly the radiopaque type, which I use in fluoroscopic bronchography for injecting medication in cases with distinctly localized lesions requiring small amounts of more potent remedies.

Special long, soft-rubber pulmonary catheters with spring-curved stylets have also been devised by me which can be easily introduced into the main upper lobe bronchi or their smaller branches.

The technic necessary for applying bronchoclysis is neither involved nor expensive. It consists of:

1. A 250 ccm. graduated drip flask with a suspension hook.
2. ¼ inch pure gum rubber tubing.
3. Two narrow double-lipped glass connecting tubes.
4. A Murphy drip tube with flow-regulating clamp.
5. A soft rubber catheter with orifice at the very tip and a Mandelbaum-Pilling introducing stylet.
6. Several short ureteral catheters, both radiopaque and non-radiopaque types with No. 10 tonsil-snare wires cut to proper length to be inserted into these fine-calibered tubes as guiding-stylets.
7. An adjustable stand of sufficient height to permit easy changing of the position of the suspended apparatus from 7 to 9 feet for the sitting patient, down to 4 to 6 feet for its use in the recumbent position.

Bronchoclysis should be performed only after proper preliminary study, which means, a careful history, physical examination, laboratory and roentgen investigation. These may more frequently than not indicate that a bronschoscopic examination is also needed. When the sputum examination or other data suggest tuberculous infection, those not familiar with this form of treatment would do well to enlist the co-operation of either a bronchoscopist or phthisiologist, or better still, both, remembering that advanced cases or those with high fever or subject to severe hemoptysis are best left for more conservative measures.

Careful preparation of the patient for the bronchial drip is as important as the preliminary clinical examination. Indeed, the very success of the procedure may hinge on this part of the operation. When it is determined that the patient is a fit subject for this type of treatment, and the contraindications are few, being mainly serious cardiac, hyperpyrexial and severely hemorrhagic conditions, we start the preparation the night previous to the treatment. Experience has shown that the early morning before breakfast is the best time, as, following a good night's rest, induced if necessary by a well-selected hypnotic, the patient's nerves are most quiet and it is easier to obtain his most helpful co-operation, in addition to which, the empty stomach avoids nausea which occasionally interferes with the smooth progress of the procedure.

The patient is permitted nothing after midnight preceding the morning of the treatment. Some cases may require a sedative such as a barbital preparation an hour or two before the treatment. Certain extremely nervous types may even require a hypodermic of morphia a half to one hour before the treatment, much as one does preliminary to tonsillectomy under local anesthesia. Local anesthesia may be induced by one of the many means in vogue, the choice of either cocaine, nupercaine or similar drugs, as well as the method of application and the strength of the solution used, being left to the operator. Solutions of cocaine vary from 2 to 10 per cent, and nupercaine from 1 to 3 per cent, according to the type of patient, as toleration to instrumentation of the throat varies greatly. Some patients do very well with a simple spraying of the throat, and hypopharynx with 2 per cent cocaine solution, while other irritable types may even require a preliminary hypodermic of morphine sulphate gr. ¼ with atropine sulphate gr. 1/150 in addition to a careful local swabbing of the throat and hypopharynx with 10 per cent solution of cocaine.

For general use, our routine is to apply a specially curved, cotton-tipped pyriform-sinus applicator, moistened with freshly-made 10 per cent cocaine solution, which we

devised, and to insert it in each pyriform sinus, first one side, and then the other. It should be held in position in each side from one to two minutes, and after an interval of ten minutes, the procedure should be repeated. This is practically the same method utilized for local anesthesia proceding bronchoscopy. Inasmuch as bronchoclysis requires the prolonged retention of the catheter in the tracheobronchial canal, it is best also to instill a few drops of warm 2 per cent cocaine solution upon the vocal cords as well as between them into the trachea, which are injected by means of a specially made syringe with a tracheal curve of my design.

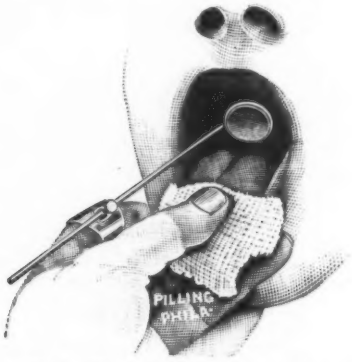

Fig. 3. Author's Finger-Holder for Laryngoscopic Mirror.

After waiting a few minutes for the anesthetic to take effect one is ready for the introduction of the tracheobronchial catheter. The wire stylet is anointed with sterile oil, such as olive oil, albolene or lipiodol before slipping it into the catheter to permit its easy withdrawal later, when the catheter is in situ. With the patient sitting in the usual position for laryngological examination, and the laryngoscopic mirror in place, either the patient himself, or an assistant holds the extended tongue.

Holding the patient's tongue in the proper position is, perhaps, the most difficult part of the entire procedure. To hold the laryngoscopic mirror in one hand and the handle of the styletted catheter in the other while trying to insert its tip between the vocal cords of the patient with someone else endeavoring to hold the tongue in the proper position, either an assistant or the patient himself, is very difficult for a great number of physicians. So, in 1928, I devised a special "finger holder" for the laryngoscopic mirror[20] which is admirably adapted for this purpose. (Fig. 3.)

The tip of the styletted catheter is inserted between the vocal cords while the patient is asked to take a deep inspiration. Before doing so, it is wise to explain to the patient that it is rarely possible to successfully introduce the catheter at the first attempt so that he will not be too easily discouraged and to retain his co-operation. As soon as the instrument has passed several inches below the cords, immediately let go of his tongue and *gently*, with one hand *fixing* the position of the catheter at the upper teeth, and with the other grasping the proximal end (the handle), of the stylet, withdraw it.

When the catheter is quickly and most gently slipped further down toward the carina of the trachea and the wire stylet withdrawn, the patient is told to firmly close his lips upon the catheter and to breathe slowly and regularly through his nose. If you fail upon your first attempt to pass the intratracheal catheter, or if in some patients it passes into the esophagus the first time it is essayed, simply withdraw it gently and wait a few moments before reintroducing it. It is assumed that the rest of the apparatus is already assembled and the fluid to be instilled is in the drip flask which is already adjusted so that it will begin to drop at a slow rate, usually beginning with about 30 drops per minute. Then connect the end of the rubber tubing by means of the free end of the double glass connecting tube by inserting it into the proximal end of the catheter held between the patient's teeth or by the operator's fingers. Then the fluid is allowed to flow into the desired region and the rapidity of the flow slowly increased up to about 40 to 50 drops per minute until 15 to 25 ccm. are injected, which is sufficient for the first treatment.

The tendency has been to drop the fluid at too fast a rate and in too large amounts during the first treatments, thus defeating the primary object of the procedure, viz., increasing the patient's tolerance to the catheter as well as to gradually accustoming him to the retention of increasing quantities of fluid.

It is better to give the smaller amounts frequently at first, in some cases 15 to 25 ccm. even as often as every other day, and

as a tolerance is established, gradually to prolong the intervals with the increased amounts instilled until a drip rate up to 60 drops per minute and a quantity up to 500 to 600 ccm. may be tolerated.

Isotonic, isothermic solutions, either plain Ringer's solution, or similar aqueous media, with the addition of antiseptic agents of bacteriostatic potency such as acriviolet, acrigentian, acriflavine, and metaphen have been used with excellent effect in all forms of purulent bronchopulmonary lesions and in cavitations, both tuberculous and non-tuberculous, without untoward results. Their particular value in tuberculous cases is a symptomatic relief, apparently due to the effect upon the secondary infecting organisms. They have also exerted a favorable influence in cases of bronchial distress following military gassing.

Unpleasant subjective symptoms attending and following this procedure are virtually nil. The physical signs produced are slight increase in percussion-dullness of the region injected and varying degrees of fine moist rales, depending on the amount of fluid used. These changes are of a temporary nature, and, depending upon the type of the lesion treated, the varying capacity of the lungs of different individuals to absorb the fluid, as well as the nature, frequency and amount of the liquid instilled, take from one to six days to disappear.

The frequency of injection is controlled by frequent roentgen study of the lungs to determine the extent, degree and duration of the tissue cloudiness (lymphatic infiltration). Many films show appearances similar to those in bronchopneumonia, but no deleterious effects were noted either subjectively or clinically, even when the roentgen clouding did not entirely disappear between treatments.

In open pulmonary lesions, whether in phthisis or the non-tuberculous forms of pulmonary suppuration, the successful outcome depends a great deal upon the preliminary preparation of the affected area. This may mean bronchoscopic suction-irrigation of pulmonary suppurative lesions in non-tuberculous subjects, or postural emptying in both tuberculous and non-tuberculous subjects.

A great, unexplored field lies before us in the possibility of finding a relatively non-toxic agent that can be applied directly to the diseased pulmonary areas.

While symptomatic relief has been afforded numerous cases by the direct instillation of iodized oil and various aqueous solutions of antiseptic dyes into both tuberculous and non-tuberculous pulmonary lesions, made possible by the chemotoxic qualities of the causative bacteria, it is hoped that some day someone will discover an effective tuberculocide that will prove effective when used in this manner.

Experience with the bronchial drip indicates that it offers a valuable addition to the rather limited armamentarium for the direct treatment of bronchopulmonary disease.

I wish to emphasize the fact that bronchoclysis, or the bronchial drip, is not offered either as a substitute for, or to the exclusion of, other forms of bronchial lavage, whether bronchoscopic or non-bronchoscopic.

Pilling Sons & Company have also made the special bronchoclysis stand which materially simplifies its use.

Conclusions

1. Bronchoclysis permits prolonged local application of remedial agents in isotonic aqueous solution to lesions of the bronchopulmonary organs, and, in effect, a flushing of the rich bronchopulmonary lymphatic system, due to the ability of the lower respiratory canal, after preliminary local anesthesia, to retain catheter-like instruments of fine caliber for longer periods than heretofore found possible.

2. It is a form of direct intrapulmonary therapy that has proven practically innocuous in thousands of instances in which this method has been used in human subjects.

3. Research on the effects of injected aqueous fluid media upon the lungs of laboratory animals does not parallel the findings following the therapeutic use of isotonic watery agents introduced into the lungs of human subjects.

4. Similar use in humans suffering with all types of pulmonary disease has failed to demonstrate that such media, properly applied, cause an extension of an already existing infection to previously uninfected areas.

5. Bronchoclysis should not be used dur-

ing the early or acute febrile stage of bronchopulmonary disease.

6. No claims are made at this time that this form of therapy is the means of obtaining "cures" of any type of pulmonary lesions. It is claimed, however, that its proper application in many forms of bronchopulmonary disease, so far as symptomatic relief and its power to return to an active economic state many hitherto semi-, and even in a few instances, completely invalided individuals, are concerned, offers much of value and is worthy of more extensive trial.

7. It is the simplest and safest means thus far devised for the direct instillation of intrapulmonary remedies, particularly when used under fluoroscopic control, as it permits exactness of the desired quantity of the agent injected as well as its definite localization to and prolonged action upon the affected region.*

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Discussion

Dr. Joseph I. Kemler (Baltimore): It is well known that poor results are of common occurrence in chronic suppurative conditions of the lung when simple bronchoscopy and suction treatment are employed. It is reasonable to assume that by a more direct treatment to the diseased area the results can be greatly improved.

We are all familiar with lipiodol injections which can be directed to nearly any part of the lung. The difficulty, of course, is that of retention. With the method suggested by Dr. Mandelbaum the catheter can be inserted to any definite area and retained there for any length of time for purposes of treatment. In this way frequent applications may prove of greater benefit. Lesions in otherwise inaccessible parts are made accessible for treatment and this has simplified what heretofore has appeared as a difficult problem.

I was very glad to hear Dr. Mandelbaum speak about a secondary infection in tuberculosis of the lungs. In my paper yesterday I called attention to the secondary infection of the larynx which produces most of the pain. Dr. Wilson of Saranac Lake seems to think that this is quite plausible. Evidently the essayist agrees with me that the secondary infection in tuberculosis plays just as important a role as the primary disease itself. It should be our purpose to remove or correct the causes of the secondary focus for the tendency of tuberculosis is to heal by nature.

Dr. George E. Wilson (Saranac Lake): Dr. Mandelbaum recently was in Saranac and demonstrated this procedure. Since he was there, we have successfully used the lipiodol in one or two patients, but not in accordance with Dr. Man-

* I desire to express my appreciation to Mr. Charles Pilling, of George P. Pilling Son & Company, of Philadelphia, for his great interest and cooperation, which enabled me to bring my work up to its present state of practical use. The equipment described in this paper was made by the above-mentioned concern.

delbaum's technic. However, we propose to continue this work and may have some results of interest to report at a later time.

This question of broncho-clysis is all new to me. I have read a few articles on the subject since talking to Dr. Mandelbaum. Now I desire to see it carried out more extensively and shall keenly await final results.

In Saranac Lake the method of treatment is more or less conservative. In suppurative cases, such as bronchiectasis and abscess, we use the bronchoscopic suctions, sometimes with the instillation of rather small amounts of medicine.

In tuberculosis we rarely do anything. Therefore it is rather startling to me to hear what Dr. Mandelbaum can do in tuberculous patients. We hesitate to do anything with them. In our opinion there is so much danger of hemoptysis and reactivation of the lesions that we do not consider bronchoscopy unless there is an urgent indication.

For a long time men have hesitated to introduce lipiodol in tuberculous cases. We too, have been hesitant although we have done it in a number of patients. In view of the essayist's experience, this is a safe procedure. The patient who was treated by Dr. Mandelbaum when he visited us was tuberculous. She came through and nothing serious happened. The passing of the catheter and the introduction of the lipiodol appeared to do no harm. It seems that we can go further with these tuberculous patients than what we at first believed was safe.

As regards the question of instillation of medicines into the lung, various medicines have been instilled by tracheal injections. This method is inadequate, however, and does not always reach the pathologic sites. Gomenol has been used, especially in spontaneous pneumo-thorax, with the idea of instilling it into the bronchial tube and attempting thus to close it. It is used in the pleural cavity with the same idea, that of closing the perforation. It has been used also in the thorax where, instead of pneumo-thorax, lipiodol is introduced. It is called oleothorax.

Jacobs introduced metaphen oil in far advanced cases of pulmonary tuberculosis where mechanical measures such as pneumo-thorax were out of the question, and would offer no help. He claimed many of the cases with profuse sputum cleared up after a few weeks of treatment. The sputum became bacilli-free and the general condition was improved very greatly. Our own results with metaphen oil have not been so good.

Gold and copper solutions by the intravenous route have been used in pulmonary tuberculosis. Gold has been discontinued, but copper is still a favorite remedy in some countries. In Buenos Aires they inject copper solution directly through the pulmonary wall into the cavity. Good results have been reported from this country.

The instruments that Dr. Mandelbaum has shown are so interesting that I wanted to mention one, that he undoubtedly knows about, the laryngeal speculum advised by a physician in Madrid. He uses the indirect laryngeal speculum to pass the catheter through. I thought that, too, was quite ingenious.

Dr. Swerling (Brooklyn, N. Y.): The essayist wanted to impress with the team work that was necessary in bronchoscopy. The patient must be properly prepared. The one who holds the head is the one who does the bronchoscopy. Without team work you cannot get anywhere in bronchoscopy.

The use of the ureteral catheter is a revelation to me. I have never dared to use it. I have used the small catheter. We have all done some bronchoscopy. I have done it for the past 12 years. Dr. Ballin in Montreal pointed out quite definitely that lipiodol will remain in the pulmonary tract from four to six weeks. He also pointed out that the lipiodol does not enter all the abscess cavities, whether they are true lung abscesses or bronchietatic abscesses. Lipiodol does not enter the cavity because the top of the bronchial tube is closed if the lipiodol rests on the top. It does not go through and a good x-ray is not secured. With the use of these lipiodol catheters it is a revelation; it goes in and there is no question about it.

We all have our ideas about antiseptics and germicides in ear and nose and throat diseases. If we are going to quote Jackson — and he is the pioneer in all of this work in this country — the greatest assistance is the restoration of the function of the cilia. In using the solution the doctor has described, he gets not only an antiseptic effect but he removes the secretions from the cilia and permits the normal functioning of the cilia. The restoration of the ciliary function, both in the nasal tract and the pulmonary tract, is the keynote to the success of all of these treatments.

Dr. Joseph Prenn (Boston): If there is any therapeutic value in lipiodol, it is due naturally to the iodine present.

I have been using ethyl-iodide by inhalation in ear, nose and throat and the bronchial tree, for some time, and have found it very efficacious. Ethyl-iodide being volatile the iodine content will reach, uniformly, every place where the air goes, if it is being used by the method and through the apparatus described in the New England Journal of Medicine, June 12, 1930-May 21, 1931.

One gets a massive dose of iodine in 1 cc., without ill effects. Clinically one observes a dislodgement, softening and liquification of the thick mucous even after the inhalation of 1 cc. to a certain degree.

It has done the work in severe cases of tracheitis and in coughs with asthmatic wheezes due to the lodgement of tenacious mucous in the bronchial tree. It should be, therefore, used in early cases of atelactasis due to the same cause.

Dr. M. J. Mandelbaum (closing): Nothing has been stated in this discussion which is not contained in my paper. In other words, as I stated, as far as the use of the catheter is concerned, Horace Green was the first to use it in 1855, followed by Darter in 1895. I re-introduced it in 1922; then Stitt used it in 1927, Garcia Vi-

cente in 1928, Oughterson in 1931, and then de Pablo of Madrid in 1932.

The use of the bronschoscope in tuberculosis was tabooed when I first took up this work. Following my European work, when I studied with Dr. Chevalier Jackson, he also cautioned us about using the bronschoscope in pulmonary tuberculosis. However, in the last two years I note that there is a reversal of feeling. Dr. Jackson himself is quoted by Flagg in one of this year's issues of the Archives of Otolaryngology on his intratracheal method of anesthesia. There is a communication from Dr. Jackson in which he states, "If any member of my family or myself were suffering from tuberculosis I would not hesitate to have bronchoscopy by a capable bronchoscopist." There are six other men who in the last four months — authoritative writers — have made the same statement.

Up to the present time I have bronchoscoped 90 patients with tuberculosis. These patients are not bronchoscoped indiscriminately.

Bronchoclysis is limited to the use of aqueous solutions, but in my private practice and also in my clinic I use oils and inhalations. Bronchoclysis only deals with isotonic aqueous solutions. Oils have nothing to do with this method.

I would like to call Dr. Prenn's attention to the fact that you cannot dissolve or absorb mucus in the human body. It is difficult to dissolve mucus, even in the test tube.

The use of medicated inhalations is palliative. The value of isotonic watery solution is that small quantities can be kept in direct contact with the diseased tissues for hours.

As stated above, it is not to be confused with bronchial irrigation. So far as I can determine, my method is the first to permit prolonged intrapulmonary therapy by use of aqueous remedial agents applied through tracheobronchial catheters of fine calibre.

In this paper my object is to emphasize the *"method"* and not the relative value of the agents used, whether aqueous, oily or gaseous, nor the curative values.

In a subsequent paper I will go into the latter phases more fully.

ELECTROCOAGULATION OF TONSILS — A BITERMINAL FLEXIBLE ELECTRODE

JOSEPH F. JAROS, M.D.
CHICAGO

In over three hundred cases in which I have performed electrocoagulation of tonsils, since 1926, I have used a simple, flexible, bi-terminal electrode in conjunction with the d'Arsonval current. The exposed wires projecting ¾ of an inch beyond the electrode at either end serve at the tip as the active points; at the base for attachment by means of a double cord to the two d'Arsonval poles of a diathermy unit. A smaller electrode has served adequately for work within the nose or any small orifice. Through the cooperation of the General Electric X-Ray Corporation this electrode has been perfected so that it possesses the following advantages:

It is practically unbreakable and will prove serviceable for years.

It has no necessarily detachable parts and yet it can be instantly removed from the cord.

It retains a constantly smooth surface which keeps clean.

It can be bent to any desirable curve or angle and remains in any set position.

Its exposed active points can be separated or approximated repeatedly at will or bent to any curve.

Its length and its narrow diameter allow of easy access to any cavity; its small weight nicely balances a light cord.

Any pillar or tongue retractor may be used whether of metal or of insulating material.

Both electrode and cord can be boiled — rendering them available in the sterile field. It is advisable perhaps for ordinary work to immerse the electrode in solutions such as metaphen or merthiolate.

Its flexibility allows of direct vision — the hand need not be in direct line with the inserted portion of the electrode.

There is, of course, no need for the indifferent electrode or auto-condensation cushion.

The approximation of the points allows of rapid, localized, accurate work — their separation allows of slower, more massive coagulation.

Because of the large diameter of the active

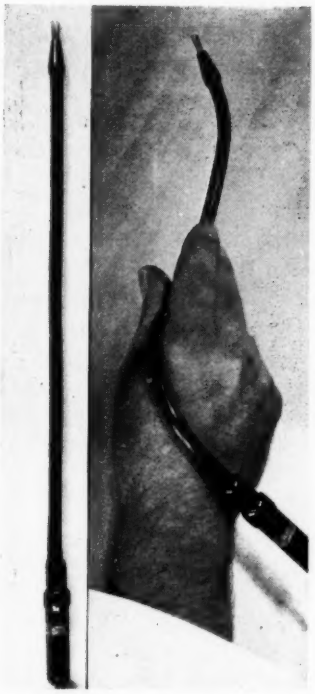

Fig. 1. Biterminal Tonsil Electrode. Illustration at right demonstrates its flexibility.

points, coagulation spreads gradually over the treated area; there is no fulguration at the point of application.

Experience with bi-terminal coagulation has led me to the following conclusions:

1. The amount of current used should not exceed 1400 milliamperes when both points of the electrode are in direct contact with metal and should be small enough so that coagulation seems to quietly flow over the area treated.

2. A suitable pillar retractor should always be used by the operator; an illuminating tongue depressor should be held preferably by the patient rather than by an assistant.

3. With the current properly adjusted, not less than one second nor more than one and one-half seconds are needed for coagulation at each application. Any undue excess of coagulation results in fulguration or frying or even a slight explosion of the tissue intervening between the active points but without injury to the patient. Coagulation extends beyond the active points and to each side only to one-half the distance separating the active points and is practically self-limited. This slight extension of coagulation should be allowed for in approaching the pillars or capsule. Since the very tips of the active points are only bluntly conical they can be inserted only into tonsillar tissue; the definite resistance of the capsule warns the operator that the capsule has been reached and that the points should be withdrawn slightly before contact is made with the foot switch.

4. Local anesthesia as described by H. M. Thometz,* in 1926, has proved sufficient in all cases. A slight sufflation of the fauces with Ethyl Aminobenzoate (Benzocaine) by means of a long nozzled powder blower such as a DeVilbiss No. 36 does very well to prevent gagging. Cocaine anesthesia, however, is not necessary. I have found that one-half to one grain of dry benzocaine taken up on a cotton applicator, previously dipped into three or four drops of oil of sweet almonds and applied to the pillars and tonsil with gentle massage, gives a more satisfactory anesthesia. Three application at intervals of two minutes suffice. This allows gentle, definite retraction of the sensitive anterior pillar and thorough coagulation under direct vision.

5. No loss of time occurs if only one tonsil is done at a sitting, and more can be ac-

* Thometz, Harry M.: Diathermy in the Removal of Tonsils. *Ill. Med. Journ.*, November, 1926.

complished at a single treatment, because the amount of discomfort is less.

6. Three sittings was the minimum; the maximum was eleven, as for instance in a patient seventeen years of age with the largest tonsils I have ever seen.

7. The simpler the case for surgical tonsillectomy, the more easily it can be done by coagulation. However, for the large, ragged tonsil with a lobulated inferior pole projecting below the base of the tongue and with pillars and a thick plica triangularis adherent, surgical enucleation, unless definitely contraindicated, is perhaps more advisable.

8. Patients over ten years of age can be treated provided cooperation is obtained during the stage of anesthetization. No preparation of the patient is necessary; no cases were hospitalized; the average time for anesthetization and treatment was about twenty minutes. The patient can eat the usual full meal immediately after treatment.

9. As in surgical tonsillectomy, an acute tonsillitis should be allowed to subside before starting treatment. With the first treatment one should aim to liberate the tonsil from the pillars and to coagulate as thoroughly as possible the dome of the tonsil well up into the supratonsillar fossa. Attacking the center of the tonsillar mass results in a crater and leaves a shell of tissue difficult of removal at later sittings. Just as after surgical tonsillectomy, remnants high up in the supratonsillar fossa and those at the base of the tongue may result in peritonsillar abscess. Tonsils can be treated alternately at intrevals of one week.

10. Bleeding in about five per cent of the cases is encountered where the coagulum early separates *en masse*, usually on the fifth or sixth day. It almost always is the result of too thorough coagulation of the base of the tonsil at the first sitting. This portion had best be done during the final treatment. An upright position with absolute quiet after rinsing the throat with cold water and a cold compress applied to the side of the neck suffice to stop the oozing within ten or fifteen minutes.

11. After trying various means to alleviate the afterpain, I have always reverted to a formula which was first brought to my attention by August Strauch, of Chicago, in 1907:

R

Ac Acetylsalicylici	4.0
Pulv. Acaciae	2.0
Aquae Destil.	30.0
Syr. Aurantii Dulcis q. suf. ad.	90.0

A teaspoonful held in the mouth so as to coat the mouth and back of the tongue before swallowing, is taken at 8 and 10 A.M., 3, 5, 7, 8, and 9 P.M.

12. Very few patients lose any time from their regular work.

13. The method requires the utmost gentleness and patience on the part of the operator, and, of course, a knowledge of the anatomy of the tonsil and the pharynx. Every patient should be impressed with the necessity of returning six months after the last treatment. The patient may be entirely satisfied and enthusiastic, but a differentiation of tissue may reveal a persistent small area which can be easily completed.

3959 Ogden Avenue.

ARCHIVES of PHYSICAL THERAPY, X-RAY, RADIUM

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Editor: DISRAELI KOBAK, M.D., CHICAGO

EDITORIALS

RADIATION IN THYROTOXICOSIS

The beneficial effect of radiation treatment in thyrotoxicosis has been so well proven that there can now be no honest doubt about it. Pfahler[1] was one of the pioneers of this method, reporting his results in 1916. In 1921, at the meeting of the American Roentgen Ray Society held in Washington, Tyler[2] read a paper in which he reported the results of a series of patients in whom the basal metabolism rate had been determined before, during and after completion of treatment. His results proved beyond doubt that the metabolism rate could be brought down to normal by x-ray therapy of the thyroid gland. In 1929, Grover, Christie and Merritt[3] reported a series of 305 cases of thyrotoxicosis successfully treated by x-rays. This series is large enough to silence all doubt and is well supported by careful history and follow-up records.

With these good records accessible, naturally many patients were treated by men of insufficient experience. Cases were not properly selected for the treatment, and when results were disappointing, overdosage was often given. In other cases treatment was continued over too long a time. These errors in treatment resulted in certain undesirable consequences. Some patients developed telangiectases in the skin over the thyroid. Where this occurred, even though the patient was completely relieved of the thyrotoxicosis, the cosmetic result caused constant mental distress.

In a small percentage of cases over-treatment resulted in fibrosis of the skin with boardlike induration. In this type of skin slight trauma, such as a small scratch, frequently resulted in considerable ulceration accompanied by slow repair and much pain. These patients naturally sought surgical re-

lief. The surgeons then condemned the method calling attention to the skin defects and the difficult surgery in the radiatized area.

During recent years the technique has been improved so that such results are no longer common. Patients are more carefully selected and treatment more accurately administered. X-ray therapy is still valuable in the treatment of ambulatory patients. On the other hand, as Ginsburg[4] points out, radium therapy has certain advantages and has come to be widely used. The chief advantages of radium are accuracy of dosage, shorter wave length and adaptability to treatment at the bedside without disturbing the patient physically or mentally. Adaptability to bedside treatment makes it possible to treat many patients classed as "inoperable" who are too ill to be moved from the bed and transported to the x-ray machine. Some physicians are using radium combined with rest and medical treatment in the "inoperable" patients, to bring them to the "operable" stage. In many patients the above régime makes surgery unnecessary.

Present day radium technic employs the gamma rays in the treatment of thyrotoxicosis. This is accomplished by using heavy filtration, considerable distance and uniform distribution. Various devices have been employed to accomplish the desired result, but the simple expedient adopted by Ginsburg[4] is the best. He employs cubes of balsa wood measuring 3 cm. on each side. These are placed side by side on a strip of adhesive plaster making a flexible collar which fits comfortably about the neck. The radium in properly filtered capsules is fastened on the side of the balsa wood cubes away from the skin. This method makes the distance fixed and accurate. Such technique allows a prolonged treatment period with no appreciable skin effects and maximum effect on the over active cells of the thyroid gland.

Radiation diminishes the activity of the cells of the thyroid by the inhibition of secretion through vacuolization of the cells, loss of cell identity and repair by fibrosis. The number of the secretory cells is reduced and the activity of those remaining greatly retarded. Coutard[5] has shown that prolonged application of a radioactive agent to cells produces a more pronounced effect than the same dosage given in shorter time. This, he explains, is due to the fact that a greater number of the cells are exposed to the agent during mitosis in the longer treatment. The more embryonic the cells the greater their sensitivity to radiation. Ginsburg's article in this issue of the ARCHIVES gives his technic in detail.

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DIATHERMY IN PNEUMONIA

Assertions in current medical literature pointing to diathermy as a valuable therapeutic adjuvant in pneumonia, has aroused considerable hope that we may now have a potential method with which to control the morbidity and mortality of this recurrent and seasonal affection. That this hope has been father to the fact, has in a general fashion been confirmed. Despite its uncritical and often injudicious use, increasing reports from reliable sources regarding its favorable effects is perhaps the greatest index of its inherent value. Its increasing exploitation by the profession, general hospitals and government institutions is the best example that it has passed the experimental stage of its existence. In an article published elsewhere in this issue, Stewart has recapitulated his observations of the value of diathermy, employed by him during the past ten years. In proportion as he became more oriented with its use, certain, favorable effects consistently manifested themselves as a result of treatment. There was relief of dyspnea and pain, slowing of pulse rate, reduction of cyanoses, improvement in respiratory function and heart tone, and sleep was augmented. As a result of these favorable changes the patient became more hopeful and hence was in better position to combat his affection. Perhaps the most invariable change recorded by all observers — Stewart in 95 per cent of his

cases — has been the temperature reduction by lysis.

That morbidity is not the only state that diathermy seems to influence in pneumonia is now attested by the evidence obtained from clinicians who have critically studied its influence on the mortality curve. Statistical studies of mortality percentages in pneumonia undoubtedly prove that the heaviest burden falls upon the institutionalized or public ward patient. The lethal curve has here been known to rise even above the 50 per cent mark. The mortality reduction with diathermy as first published by Stewart in the series of 200 cases treated at the United States Marine Hospital might have been considered as a spectacular but accidental evidence were it not for the fact that later studies by the same author and other observers confirmed his findings by even a lower statistical percentage. In contrast with controls treated in the orthodox fashion, Stewart's cases showed a 19 per cent mortality against a 42 per cent when medication alone was used. Since then other workers have reported a considerable lowering of the death rate than that reported in the initial studies by Stewart.

The lowest per cent recorded has been that of Stephenson, Commander, Medical Corps, United States Navy, at the Naval Hospital, in New York, who reported a mortality drop of 8.4 per cent in 114 patients. In his discussion of Stewart's paper he qualified his findings in the following statement: "It might be the fact that we had a selected group of patients. This may have had something to do with the low mortality. But I do firmly believe that those of us who have failed to use diathermy in the treatment of pneumonia are failing to use a very effective measure . . . . If I should ever be ill at sea with pneumonia and there is a diathermy apparatus available, I should hold that man responsible who had failed to give me all that he could do in the method of relief if he does not give me diathermy."

Stewart's more recent figures, which incorporated studies in over 800 patients, has shown a further drop in his mortality curve, i.e., to 11.9 per cent. The increased efficiency of his treatment is attributed to wider experience with the method. It incorporates a better and more stable technic, the use of larger electrodes, greater amperage, and more frequent treatments, depending upon the severity of the case. Each patient is treated according to the special needs, rather than to arbitrary rules. He has moreover disposed of a polemical undercurrent discussion with reference to voltage. He counsels: "Anyone of the standard, portable machines today is sufficient to do serviceable work. Christies' studies at the Rockefeller Institute were not done with the high voltage machines. In spite of this the thermocouples in the tissues showed a rise of heat. I believe that any standard portable machine is sufficient for the work at hand."

While the clinical results obtained have been sufficiently impressive to warrant the adoption of diathermy as at least an important adjuvant in the treatment of pneumonia, the problem rather than becoming static now suggests the need for further interpretations. In science new doors opened lead to intriguing chambers, at the end of which is to be found further doors to excite our curiosity. At the end of phenomena there is always noumena. It is the endless chain which science in quest of new knowledge always encounters. The hypothetical query will soon be raised, if its voice is not already on the horizon; namely, Of what advantage to raise the temperature in one where there is already an existing temperature? The answer to this can for the moment at least be dismissed on empirical basis; for it has been demonstrated that mortality and morbidity have been favorably and consistently influenced when diathermy has been intelligently applied. To this extent physical therapy has again contributed a substantial adjuvant to medical practice.

ZINC IONIZATION IN CHRONIC OTITIS MEDIA

Every once in a while our attention is attracted to this method of treating otitis media of the suppurative type. Its popularity is due in no small measure to Friel of London, who has published numerous articles describing the technic and giving statistics of cures and failures.

More recently Asherson[1] of London, discussed the subject at length. In this article Asherson's main purpose is to indicate the ex-

act type of case that will respond and to describe the assembling of a suitable apparatus which can be easily constructed by anyone.

It is interesting to read in Asherson's paper: "Even in these enlightened days when all knowledge spreads rapidly, it is surprising to find how many practicing otologists are unfamiliar with the use of this method; while many who have not realized the type of case in which to apply it, openly sneer at its use."

A summary of approximately one hundred cases of otitis media treated by zinc ionization was presented by Reynolds and Whitney.[2] In this summary original observations are described. In Table I, 60 cases of otitis media treated by zinc ionization are listed. In 36 in which the treatment was indicated, 20 or 55 per cent were cured, 15 or 42 per cent were improved, and 1 or 3 per cent was unimproved. These writers affirm: "In the great percentage of cases of otitis media, zinc ionization can only be expected to produce palliative results until the indicated surgery is completed. In this group is included all of those patients having a bloody or purulent discharge and especially those needing a mastoidectomy or adenoidectomy." In their opinion, zinc ionization as applied to the middle ear is merely a more effective method for the application of an astringent than the topical method and should only be used as such.

While these conclusions are not in accord with those of other investigators, the trend of opinion is that of definitely rationalizing a method which merits more consideration on the part of otologists and which is now coming more strongly to the fore.

Probably one of the more advantageous uses of zinc ionization is after the radical mastoidectomy has been performed without complete cessation of the otorrhea. On this subject Hollender[3] has pointed out: "After the radical mastoid operation, there sometimes remains a suppurative discharge which is due to one or more causes. In those cases in which this otorrhea is not due to bone pathology, zinc ionization is of benefit, and, in numerous instances, has produced a cessation of discharge."

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SPEAKERS ON PHYSICAL THERAPY AVAILABLE FOR MEDICAL PROGRAMS DURING WINTER SEASON

Through its Educational Department the Congress is in a position to furnish complete programs on physical therapy subjects for county medical society and hospital staff meetings. Speakers are available also for specialty societies. As the schedule for the winter is now being prepared, society secretaries are urged to file their requests for assignment of speakers at the earliest possible time.

The committee in charge of this extension work will cooperate with representatives of local societies in suggesting appropriate subjects, in organizing symposia, demonstrations, clinics and such other programs as may best suit the needs of the local group. The Congress, by reason of its large membership, is well represented in every section of the country. As no fee is charged for the service, except the cost of transportation of the speakers, the expense, in most instances, can be held down to a nominal sum. Requests may be made for special speakers, and whenever possible, these requests will be granted.

The following subjects have been selected simply as suggestions:

Medicine and the Medical Specialties—

The Scope of Physical Methods in Arthritis.
Diathermy: Principles and Practice.
Treatment of the So-Called Neuralgias.
Physical Measures in the Management of Bursitis.
Ultraviolet in Every Day Practice.
Corrective Exercise: Some Uses in a Well Regulated Physical Therapy Department.
Diathermy as an Aid in the Treatment of Pneumonia.
Late Progress in Fever Therapy.
Ultraviolet as an Aid in Dermatology.

Surgery and the Surgical Specialties—

The Rôle of Electrosurgery in Cancer Treatment.
Electrosurgery in Urology.
The Treatment of Endocervicitis.

Physical Therapy in Industrial Practice.
Physical Aids to Orthopedic Treatment.
Radium Treatment of Uterine Fibroids.
The Electrosurgical Cutting Current.
The Treatment of Hemorrhoids.

Eye, Ear, Nose and Throat —

Electrocoagulation of Tonsils.
The Management of Carcinomas Involving the Oral Cavity.
Ultraviolet in the Treatment of Corneal Ulcers.
Reduction of the Inferior Turbinal by Diathermy.
Indications and Limitations of Ultraviolet Irradiation in Otolaryngology.
The Treatment of Laryngeal Tuberculosis.
Physical Therapy Aids in Nasal Sinusitis.
Zinc Ionization in Rhinology and Otology.

Short Wave Therapy

In recent months, short wave therapy has awakened considerable interest. The names of the physicist Esau and the internist Schliephake of the University of Jena are mentioned in this connection. The purpose of short wave therapy may be a strengthening of the general defense forces of the organism or it may be justified by the alleged immediate local effect. Schliephake pointed out before the Berlin Medical Society that the short waves furnish a means of direct attack on pathologic foci, which heretofore was possible only through the use of roentgen rays. The short waves employed have a length of several meters and are sometimes referred to as "meter waves." Professor Esau demonstrated the "Siemens ultra short wave therapy apparatus."

This research was begun in 1926. A study of the mode of action of the "meter wave" was made possible by the production by Professor Esau of waves of great energy. The difference in the action of these short waves, as compared with all other electric currents, is based on the fact that the action passes through the body without resistance and affects all tissues in a uniform manner.

The various wavelengths produce a diverse effect, which is in direct relation to the ionization of the tissues. In an experiment it was shown that in various substances that, thrown in a heap, are subjected to the field, a differentiation in the amount of heat produced in the various substances is plainly observable and that by the substitution of another wavelength the mutual relation of the heat produced in the several substances will be changed. These results cannot be applied as yet, in a practical way, to man; it has been shown, however, that the destruction of bacteria in the short wave field depends on the length of the wave. Changes in the red and the white blood count and in the protein values of the blood serum may be observed. The blood sugar level is changed, especially on application of the wave to the brain and the region of the pancreas. From the standpoint of therapeutics the speaker referred chiefly to furuncles, carbuncles and whitlows, which are cured in an unusually short time by resorption of the pus. Good results were secured also in purulent conditions of the maxillary sinus; even patients with empyemas of long standing became entirely rid of their symptoms. In empyemas of the pleura, the short wave treatment effected striking improvements. This mode of treatment is susceptible of further development and it opens to scientific research many enticing prospects. Few experiments on man have yet been made with the method. The results, it is true, are promising but they are based on so few cases that extensive further research will be needed. — Foreign Letters, *Jour. A. M. A.*, Oct. 8, 1932.

CURRENT NEWS AND SCIENCE

Nobel Prize Shared by British Physiologists

The 1932 Nobel Prize in medicine and physiology was given Sir Charles Scott Sherrington of Oxford University and Prof. Edgar Douglas Adrian of Cambridge University for research on nerves. Sir Charles was a pioneer investigator into the reflex action of nerves when Prof. Adrian was still in the nursery. Sir Charles did a large amount of experimental work on all phases of nerve activity. He brought together knowledge of how the nerves all work together.

Prof Adrian, who at the comparatively young age of 43 years, shares the Nobel Prize with Sir Charles, has made investigations on the nerves with the aid of very modern physical instruments. He has applied the modern amplifying methods of radio to the measurement of the current in single nerve fibers, and was the first to measure the current of such a single nerve fiber. — *Science News Letter,* November 5, 1932.

Ultraviolet Rays in the Body

What may develop into a powerful new agency for the treatment of cancer, leukemia and similar afflictions has been discovered at the University of Pennsylvania's Graduate School of Medicine. Dr. Ellice McDonald, director of the school, announced recently that when organic substances in solution are injected into the blood and then caused to fluoresce by x-rays from the outside, ultraviolet rays are given off that kill germs and cancer cells. The discovery is the result of 4 years' work and is still so new that Dr. McDonald and his associate, Dr. A. S. Allen, ask for more time to appraise its possibilities.

Especially striking is the fact that the wave length of the rays generated within the body can be changed within limits. In other words, the ray can be generated that kills the particular type of cell or germ with which the physician has to deal.

That solids will fluoresce under x-rays has long been known. Common salt and certain dyes will glow under the x-rays. Fluorescence of solutions under x-rays, however, is apparently something new — at least within the body. When such solutions are introduced into the system and then subjected to the action of x-rays the effect is much more marked than when x-rays are used alone, as is the customary treatment of cancer. Even if it should develop that cancer cannot be cured in this way, it is something to have vastly increased the power of x-rays and the gamma rays of radium in treating internal growths. — (*New York Times,* August 28, 1932.)

Breathing of Living Tissue Is Disturbed by X-rays

X-raying living tissue apparently disturbs its respiration in such a way as to drive out hydrogen, and the loss of this hydrogen is probably largely responsible for the death of the tissue.

This discovery was made by V. Everett Kinsey of the Westinghouse Research Laboratories at East Pittsburgh. He x-rayed pieces of normal human muscle and of cancerous tissue removed in surgical operations, keeping his specimens in a specially built glass vessel to collect the gases given off for analysis. He found that hydrogen, not normally a by-product of respiration, is given off when either healthy or diseased tissue is x-rayed. — *Science News Letter,* November 5, 1932.

Bibliography On Oral Physical Therapy

"The Special Committee of the Section on Stomatology of the Eleventh American Congress of Physical Therapy hereby enlists the cooperation of all dentists who have contributed to dental physical therapy — ultraviolet, diathermy, infrared, electrosurgery, etc. — to send in the titles and other information pertaining to their lectures, published papers, courses, etc., for incorporation in the final Committee report."

"The report will include besides the instruction in physical therapy given in the dental schools, courses offered by dental societies. Secretaries of dental societies will confer a

favor by submitting the desirable information. The report will appear in the ARCHIVES OF PHYSICAL THERAPY, the official journal of the Congress. The efforts of dentists in the field will indeed be a credit to the dental profession by receiving its due share of recognition in the development of oral physical therapy.

HARRY M. MOSS,
ROBERT J. READE,
ALFRED J. ASGIS, *Chairman,*
Section on Stomatology, American Congress of Physical Therapy, 310 W. 72nd St., New York.

X-Rayed Cells Live Faster; Die of Premature Old Age

When x-rays are used to treat cancer, the cells of the cancer are not killed directly but are made to live more merrily, finish their normal life more rapidly and die of senility at an earlier age.

This answer to the hitherto unsolved problem of what happens when a cancer victim is irradiated and his cancer decreases in size was given to the American Association for the Advancement of Science by Dr. Raphael Isaacs of the University of Michigan, who made observations on 923 patients before he announced his findings.

It is expected that this discovery will be of great importance in understanding various kinds of cancer and other diseases of cell growth, such as leukemia, lymphoblastoma and pernicious and other anemias.

Treatment of cancer by x-rays results in a premature old age, Dr. Isaacs found. The premature old age occurs not in the patient but in the cells of the malignant growth with which he is afflicted. This is a case where premature senility is welcome.

Dr. Isaacs studied the various kinds of the blood cells and noted the effect of the x-ray treatments given the patients. Even after x-ray therapy, the blood-forming cells, both white and red, go through their lives in an orderly manner and die normal deaths.

"Nothing happens to the cells that would not have happened to them if they had their normal life," said Dr. Isaacs, "except that x-rays make them go through the process somewhat faster. X-rays act by hurrying the onset of old age and not by killing directly."

Radiologists have noted that there is a lag between the time of the x-ray treatment and the effect that is produced. Dr. Isaacs said that it corresponds to the time it takes the irradiated cells to live and die, in an accelerated but normal manner. Some cells, like germ cells and white blood cells, die fairly quickly after treatment with x-rays. Dr. Isaacs finds that these cells have a short adult life and therefore die soon after it is reached. Other cells, like those of muscle, nerve and fibrous tissue cells, live long after they become adults and when stimulated to develop to maturity by x-rays, they do not die of senility for a long time. The effects of the x-ray treatment are therefore delayed longer.

A favorite explanation of the action of x-rays and radium on the cancer and other cells has been that they killed the cells, but the researches reported by Dr. Isaacs repudiate this theory. — *Science News Letter,* July 9, 1932.

X-Ray "Baths" Now Possible for Patients With Tumors

X-ray "Baths," which irradiate the whole body of the patient for long periods, instead of attacking local spots intensely but briefly, are now available at Memorial Hospital, New York City. They are designed for the treatment of patients suffering deep tumors.

The new set-up for tumor treatment was described before the American Association for the Advancement of Science by Dr. G. Failla. Dr. Failla paid a tribute to the memory of his colleague, the late Dr. Arthur C. Heublein of Hartford, Conn., who supplied both the means and the technical knowledge in the development of this special ward, and in the end sacrificed his life to it through illness induced by overwork.

The ward consists of four beds arranged about an x-ray machine capable of continuous operation at 185,000 volts and three milliamperes. The patients are kept bathed in its continuous discharge.

It is too early as yet, Dr. Failla said, to permit the clinicians at the hospital to draw definite conclusions as to the efficacy of the new method. However, he continued, some striking results have been obtained in a few cases of generalized radiosensitive tumors, which could not have been obtained by the ordinary methods of x-ray therapy.

At the same symposium with Dr. Failla,

Dr. H. J. Bagg, also of Memorial Hospital, told of animal experiments performed in this same x-ray "bath." Mice with transplantable tumors have been exposed to the radiation for several weeks, with the result that their life has been prolonged very materially. This has been accomplished without apparent ill effects, since the body weight has remained normal.

Another line of research at Memorial Hospital described by Dr. Failla has been an attack on the problem of the best kind of x-rays to use on various kinds of tumors, and the most favorable times of exposure. It has long been established, he said, that gamma rays from radium are in general more effective than x-rays. The new research has shown that the shorter and "harder" the x-rays are, the more nearly they approach the effectiveness of gamma rays. This was to be expected on theoretical grounds, since gamma rays are the same kind of radiation that x-rays are, only of very much shorter wavelength and considerably more penetrating. The new 700,000-volt x-ray tube in use at the Memorial Hospital gives radiations approaching gamma rays in their nature; and Dr. Failla expressed the opinion that even more powerful tubes are needed, especially for attack on deep tumors. — *Science News Letter,* July 16, 1932.

Nudism Unnecessary for Sufficient Ultraviolet Light

Nudist cultists and others who preach extreme exposure of the human body can not justify their fads on the grounds that they are necessary to prevent rickets.

Keep your hands and face uncovered in the moderate sunshine such as occurs at the latitude of middle New York state, Prof. Arthur Knudson of the Albany Medical College, told the American Association for the Advancement of Science, and there need be no fear of being afflicted with rickets, the disease of the bones that arises from lack of ultraviolet light or vitamin D.

Experiments with rats showed Prof. Knudson that if one-eightieth of the surface area of the skin were shaved and bared to the sun's radiation, greater healing of rickets was produced than if the whole animal was exposed. Although through three to four months of winter the sunshine does not contain curative rays, the body builds up sufficient reserves in summer to prevent rickets during the winter.

Ungloved hands and exposed faces of children or adults will give sufficient chance for the sun to do its protective work and nude sunbaths for normal persons would not seem necessary in the light of Prof. Knudson's experiments. — *Science News Letter,* July 16, 1932.

Chemical Cure of Cancer Foreseen by Researcher

"A chemical cure of cancer seems only a matter of time, trouble and intelligent effort," declares Dr. Ellice McDonald of the University of Pennsylvania Cancer Research Laboratories in a report to the *Journal of Chemical Education.*

The problem of cancer should be attacked from the chemical angle, Dr. McDonald says. The cancer cell has a different set of chemical reactions from normal cells. It produces from 5 to 20 times as much lactic acid as normal cells, and it is defective in oxidative processes, that is, in the use it makes of oxygen in its production of heat and energy. Hope of changing the chemical reactions of the cancer cell back to normal, lies in the ability of scientists to find a way to repair this injury to its oxidative processes. This is the line of attack which Dr. McDonald believes will eventually bring a solution of the cancer problem.

In his report, Dr. McDonald calls attention to the enormous annual mortality from cancer. In the United States about 130,000 people die of cancer every year. In Canada during the four years of the war the cancer deaths among men and women at home were almost exactly equal to war casualities.

X-rays, radium and surgery are the only successful means at present of treating cancer. Even with them under the best conditions, only one-third of the cases, as they come to the physician or surgeon, can be cured. Actually, the total proportion of cancer cures is estimated at between 5 and 10 per cent in this country. There is great need of active research as the total number of deaths is constantly increasing. — *Science News Letter,* April 23, 1932.

THE STUDENT'S LIBRARY

PHYSICAL THERAPEUTIC TECHNIC. By *Frank Butler Granger,* A.B., M.D. Second edition, revised by *William D. McFee,* M.D., Visiting Physician, Department of Physical Therapy, Boston City Hospital. Cloth. Price, $6.50. Pp. 436, with 135 illustrations. Philadelphia & London: W. B. Saunders Company, 1932.

Granger's original work was written for the beginner in a simple style. It covered the ground of physical therapeutics embracing the various electrical currents, light, massage and hydrotherapy. Certain special diseases in which physical agents were found valuable were accorded separate chapters. No doubt Granger believed that the use of light, heat, electricity and massage should be emphasized whenever any of these was of unquestionable indication.

The newer edition of Granger's book is an attempt to bring it down to date by including the more recent advances in the field of physical therapeutics. It is regrettable that some of the newer developments have been omitted. The reviewer refers particularly to fever therapy as an example.

Specifically, one should refute a claim made with reference to the drop in blood pressure resulting from autocondensation: "The average case remains at least half the drop between treatments." Another claim which has not been borne out by experience is the assertion: "In adults the electrodesiccation method of McFee (for tonsils) is the physical therapeutic treatment of choice." Still another irrational claim is made with reference to deafness: "Bellows has had success with the ultraviolet light, using the Curay instrument and special quartz applicators." None of these claims has ever been fully substantiated. There are many others of a similar nature, some of which appear even more far-fetched.

One is confused with the contents of Chapter XXXIII dealing with the tonsils, in that the preference of certain technics is contraindicated by the statements contained in Chapter XXXV. The reader is thus left in a state of uncertainty. While Chapter XXXV purports to cover the specialty of ear, nose and throat, it is far from complete. Numerous methods are suggested, some of which are of proved value, while others have been found to be inadequate even as aids to accepted procedures.

The book in general has considerable merit both for the beginner and for the advanced student of physical therapy. The criticisms which have been made are intended as constructive and in no way reflect on the presentation in general. There is seldom published any book on a medical subject which meets universal approval, and this therefore is no exception.

Dr. Granger who was a pioneer in physical therapeutics did much for the promotion of the science. His written work will live as a testimonial to his achievement. As a reference volume, it is an invaluable aid; as a text it should have a representative voice in the expression of authoritative opinion on the many subjects included in the specialty of physical therapeutics.

The book is well illustrated. Mechanically it is of the same high calibre as is characteristic of other good books of this publishing house.

GEBURTSHELFER UND ROENTGENBILD. Erweiterung und Erneuerung der Geburtshilfe durch die Roentgendiagnostick. By Univ. Prof. *Wilhelm Liepmann,* Director of the German Institute for Gynecology and the Gynecologic Clinic "Cecilienhaus," Berlin, and Dr. Gerhard Danelius, Assist. of the Radiation Institute of the "Cecilienhaus." Paper. Price, $5.95. With 160 illustrations. Pp. 262. Urban Schwarzenberg: Berlin and Vienna. 1932.

This excellent monograph enables one to see for oneself what has heretofore been regarded as theoretical, and demonstrates, that roentgen pictures may be a very valuable adjuvant to the field of obstetrics. The roentgenography of the fetus in utero which has always been technically difficult, is here clearly demonstrated by using a 90 to 100 cm. distance with the patient on a Bucky diaphragm. The authors have most uniquely and artistically reproduced the fetal skiagrams. Throughout this book, which is really an atlas on obstetrical radiography, the authors present their roentgen findings along side of artistic reproductions with the legends thereof in German, English and French.

Contrary to the popular concept the fetus is shown to have unusual freedom in mobility and does not become an egg-shaped ovoid in a pent-up position in lieu of economy of space. The fetus is really contained in a loose uterine sack wherein it is capable of motion and rotation. The fifth chapter is very interesting and discusses the changes in position that occur during pregnancy. Regarding the many factors that influence the changes in the fetal position the authors have conducted some unique experiments with before and after roentgenograms, which are very conclusive. Thus the action of gravity that many books give precedence for favoring the cephalic position is almost demonstrated before your very eyes by the placing of patients in a deep Trendelenberg position with the resulting institution of breech for cephalic position. The position of the fetus was likewise affected by swivel chair rotation of the mother. Before and after pictures also show spontaneous changes of the fetus occurring late in pregnancy even up to the time of labor. The authors employ their own terms for hitherto undescribed changes in fetal position. Thus the "spring-board" position together with a lucid, graphic representation, shows how the baby using the ileum like a diving board may voluntarily change its position from time to time.

Another example of this may be noted when the authors employ the simile of the roulette wheel and the sinking of a golf ball in its hole, for the impressive comparison of the phenomena of rotation of the fetal body and the fixation of the fetal head in the pelvic cavity. It is surprising how roentgenography can be made useful in many obstetrical conditions; thus breech positions in scoliosis and contracted pelves, the effect of large myoma and the interesting anomalies of rare fetal positions are here visualized for you. Roentgen pelvinmetry, multiple pregnancies, and malformations of the fetus are most interestingly presented. The x-ray in diagnosis of fetal monstrosities plays an important rôle. The roentgen visualization of the mechanics of labor presented at the close of the book is as informative as the other chapters that preceded it. Throughout the book the authors quote Warnekros who wrote a similar book, whose experiments and findings are here amply verified. It is a pleasure to recommend this monograph to all obstetricians and roentgenologists as a very useful reference manual.

SURGERY, ITS PRINCIPLES AND PRACTICE. For Students and Practitioners. By *Astley Paston Cooper Ashhurst,* A.B., M.D., F.A.C.S., Professor of Clinical Surgery, University of Pennsylvania. Fourth Edition. Cloth. Pp. 1145. 1063 illustrations, 15 colored plates. Price $10.00. Philadelphia: Lea & Febiger, 1931.

It is with a feeling of deep sorrow and a sense of our loss that this work is discussed. Its distinguished author has been torn from our midst prematurely while he was at the height of his mental and physical powers. The critique becomes an obituary. But Ashhurst has not lived in vain, the fourth edition of a really painstaking text-book of surgery being one of the footprints he has left in the sand of time.

Ashhurst's reputation as a surgeon and surgical teacher has been established a long time since, to which one may now add his attainments as an army surgeon during the World War, during which he gathered experience which he made use of in the preparation of the last edition. The work itself is divided into twenty-nine chapters, grouped as General Surgery, Systemic Surgery, and Regional Surgery. When it is considered that fifteen colored plates and 1,063 illustrations enhance the clarity of a carefully prepared text of 1,145 pages (exclusive of a good index) one can appreciate that the subject of surgery has been covered about as fully as is possible in a one-volume manual. It may be pointed out that even encyclopedic works have fallen short of being exhaustive, and so it would be asking the impossible to cover the entire known field of surgery in one volume. But for the student seeking a solid foundation and for the general surgeon seeking quick orientation in everyday surgical problems the material is ample and satisfying. Even electrosurgery, to cite one example, has been treated by the late, lamented author to bring his work down to date.

It is true that Ashhurst could perhaps have distributed the space of a text in a manner to emphasize the difficulties and pitfalls of a number of difficult surgical operations and by devoting more detailed description of the difficult operative steps, as for example in retroduodenal choledochotomy. But one must not forget that a surgeon venturing in this almost specialistic field is presumed to be a trained, experienced and skillful operator, while there are many other operations of a more or less emergent nature which virtually every general practitioner who is thrown on his own resources is supposed to be able to perform. For the latter the present volume will prove a reliable guide.

If this is the criterion of a good text book it can be stated without fear of successful contradiction that Ashhurst's "Surgery" is one of the most representative, concise and informative American text books of surgery, which should be owned and read by every senior medical student and general surgeon.

THE PRACTICAL MEDICINE SERIES COMPRISING EIGHT VOLUMES ON THE YEAR'S PROGRESS IN MEDICINE AND SURGERY: PEDIATRICS. Edited by *Isaac A. Abt,* M.D., with collaboration by *Arthur F. Abt,* M.D. Series 1931. Price $2.25. Chicago: The Year Book Publishers, 1931.

Modern medical literature is enormous in its volume and scope. The busy practitioner is at sea in the mass of periodic literature that he should peruse. So, the preparation of abstracts from the medical articles of importance is a praiseworthy task.

This is one of the books of an eight-volume series, published each year, covering the previous year's progress in medicine and surgery.

Articles abstracted have been well chosen so as to give information on a large group of subjects. The comments of the editor add greatly to the value of the book. It is to be regretted that these comments have not been made more numerous, as well as more extensive.

The busy pediatrician, unable to comb through the periodic material, both in English and other languages, will find this book of aid to him in keeping up with the progress in his field.

THE HEART RATE. By *E. P. Boas,* M.D., Associate Physician, Mt. Sinai Hospital, New York City, and *E. F. Goldschmidt,* Ph.D., Research Fellow, Department of Surgery, Yale University, School of Medicine. Cloth. Pp. 166. $3.50 Springfield: Charles C. Thomas, 1932.

This monograph represents the findings in a most important piece of cardiac research. It is based on continuous observations with the cardiotachometer over many hours on the heart rates of 356 individuals, 103 of whom were in apparently good health. The remainder of the group present varying abnormal conditions of interest in heart rate studies. Especially do we consider the changes noted during anesthesia, in the process of diverse operative procedures, of clinical import, and the changes occurring in various types of cardiac pathology, contrasting the waking period with the heart beat as it occurs in sleep. The book is highly illustrated by means of graphs and tables which increases the understanding of the work here accomplished. A very complete bibliography is appended. This monograph is of importance to every thinking internist.

A CENTURY OF PROGRESS SERIES: QUEEN OF THE SCIENCES. By *E. T. Bell,* Ph.D. Professor of Mathematics in the California Institute of Technology. Cloth. Pp. 138. Price $1.00. Baltimore: The Williams & Wilkins Company and Associates in cooperation with the Century of Progress Exposition, 1931.

The author of the foregoing volume enjoys the dual distinction of being a mathematician of note and an author of exquisite fiction. The reviewer is able to pay more familiar tribute to the latter phase of the author's talents than to the former. It was a stroke of good judgment to have induced so talented an individual to present to us the century of progress in the field of mathematics. The *Queen of the Sciences,* or mathematics, has been written in a style that may be defined as warm, sympathetic and cogent. It embodies imagry of thought that binds and clarifies the logic and the historical evolution of mathematics in an unusually attractive form. Professor Bell has transferred the literary tone of his exposition from, as it were, the environment of chill scholastic corridors and transplanted it to warmer humanistic borders. He has presented in swift strokes a colorful, sympathetic and brilliant picture of the aims and purposes of mathematics. In the space of 138 pages the author has managed to present a clear picture of the progress of this science, a science which Jacobi has stated is the true and greater glory of the human mind. As pointed out by Bell, "Progress in this field of knowledge has been so vast in the past century that few men would presume to claim more than an amateur's acquaintance with more than one of the four major divisions of modern mathematics. The field of higher arithmetic alone as it exists today is probably beyond the complete mastery of any two men, while geometry, algebra and analysis, especially the last, are of even greater extent." The foregoing opinion is interjected to demonstrate the large canvas upon which the subject is described and to prove that its exposition into popular phraseology required the unusual talents of one who has had *liaison* practice with his lay public.

The contents have been separated into ten chapters, each dealing with an important phase in the evolution of mathematical thought. While in a sense it may be a work for "advanced thinkers," yet the fact is obvious that it has been transmuted into that form of understandable and vivid diction as to make it comprehensible to average readers. To keep apace with the general progress of one's period this book offers a rich intellectual opportunity.

ANATOMY OF THE BRAIN AND SPINAL CORD. By *William W. Looney,* A.B., M.D., Professor of Anatomy, Baylor University College of Medicine, Dallas, Texas. Second Edition. Cloth. Price, $4.50. Pp. 370, with 153 illustrations. Philadelphia: F. A. Davis Company, 1932.

The fact that the medical profession is appreciating more and more the need of accurate diagnosis of neurological disease emphasizes the value of a thorough understanding of the structure and functions of the nervous system. As the author remarks: "Without such understanding the physician is certain to meet with many embarrassing situations, whether he be a specialist or general practitioner. It becomes the duty of every medical student, therefore, to make himself sufficiently conversant with the anatomy and physiology of the nervous system so as to be able to recognize when he is dealing with an abnormal condition of that system."

The book is divided into 20 chapters and contains 153 illustrations. These aid materially in explaining the text material.

In Chapter XX, twelve interesting case histories are detailed. The purpose of these histories is an applied one. In each history there is an interpretation of the symptoms and findings, and finally a diagnosis. The accompanying illustrations point out the locations of the lesion in the brain and in the body. The value of these history studies to the student cannot be overestimated. They represent a contribution for which the author merits much praise. And as is remarked in the preface: "No longer is the student forced to learn dry facts concerning the structure of the brain and spinal cord, but those facts are now linked with the functions of the organism in the process of adjusting itself to its environment."

Every medical student can well afford to acquaint himself with the anatomical and physiological facts concerning the central nervous system with which this work deals so comprehensively. For those for whom this subject is somewhat foreign, the book represents an indispensable addition for reference purposes. The simplicity in description and arrangement of the material are commendable achievements of one who has devoted himself to such an undertaking as this splendid volume.

THE CHEMISTRY OF TUBERCULOSIS. By *H. Gideon Wells,* M.D., Ph.D., Director of the Otho S. A. Sprague Memorial Institute and Professor of Pathology, University of Chicago, and *Esmond R. Long,* M.D., Ph.D., Director of the Laboratory of The Henry Phipps Institute for the Study, Treatment and Prevention of Tuberculosis, and Professor of Pathology, University of Pennsylvania. Second edition. Cloth. Pp. 481. Illustrations. Price, $7.00. Baltimore: The Williams and Wilkins Company, 1932.

The authors have for many years been leaders in this special field of investigation and have made many valuable contributions to the progress of tuberculosis research. This second edition finds Doctor Lydia De Witt, a co-author in the original contribution, taken by death, and while the field of chemotherapeutic research in tuberculosis has suffered a great loss in her passing, the authors have taken over her part of the text and revised it to date. There has also been a complete revision of the remainder of the text. Those portions which have become obsolete have been removed and newer contributions, based on more modern research and findings, supplant them. The text of the seventeen

chapters is divided into three sections: I. The Chemistry of Acid-fast Bacteria. II. The Chemical Changes in the Tuberculous Host. III. The Chemotherapy of Tuberculosis.

Particularly in Section I has much new research been done. Aided by grants from the National Tuberculosis Association, groups of research workers in different parts of the country have carried on investigation in different phases of the chemistry of the tubercle bacillus. Doctor Long and his associates have contributed much to the purification of tuberculin, which is herein described. Under chemotherapy there is a liberal discussion of various substances that have been suggested in tuberculosis therapy, but none, from the authors' review, have much to offer in aiding the curability of this disease. Every tuberculosis worker should have a copy of this book.

PLASTIC SURGERY OF THE NOSE, EAR AND FACE. By *Victor Frühwald*, M.D. Translation by Geoffrey Morey, M.B., B.S. (Adelaide), D.L.O. (London). 86 pp. Cloth. Price, $4.00, postage prepaid. With 88 illustrations. Vienna. Wilhelm Maudrich, Publisher, 1932.

The author stresses the fact that plastic surgery cannot be mastered from the book alone, that practical work is essentially necessary. However, a little book of his type in helping to refresh the memory of doctors who had done practical work might be of value.

The plan of description of cases is good, and, as is mentioned in the foreword, "the book is given the freshness of a temperamental lecture." Personal experience is injected into every discussion. This is quite obvious even on first perusal and characterizes the original touch which the book possesses.

It should be stated that plastic surgery is by no means an old branch of surgery. A little more than half a century has passed since the pioneer work of de Martino in correcting an aural deformity. In America the science has developed rapidly. A saner viewpoint has been accepted by the medical profession, which, heretofore, had looked upon anybody who was engaged in cosmetic surgery as a charlatan. The excellent results of orthodox surgeons in plastic corrections speak for the necessity of this work and for the continued interest in research and clinical experimentation. The situation has changed forcibly since the World War. Men of international repute have contributed to the specialty.

After a very brief description of the anatomy of the nose, the author goes at once into a discussion of deformities of the bony nose. The correction of all types of nasal humps are considered.

Saddle nose is briefly mentioned, probably only to emphasize that the paraffin method has now been almost entirely abandoned. Malformation of the tips of the nose are common. This subject therefore is more detailed and is further illustrated with diagrams.

Deformities of the ear are next considered. Joseph's operation on hard cartilage of the ear and Alexander's second operation are described. The author recognizes the fact that helpful suggestions of other workers are valuable and undoubtedly lighten the burden when the correction of a serious deformity is planned. As the description of technic is always important for the student, this phase of the work has been adequately planned and adhered to by the author.

Much information is contained in this small volume which should serve as a pleasing and quick reference to the busy specialist. When simple problems present themselves, the information required to refresh one's memory, the operative technic indicated, need not be sought in larger systems on operative surgery. It is found quickly in Frühwald's. The book is a real contribution to the otolaryngologist's reference library. The outstanding feature is the fact that padding is an obvious omission.

INTERNATIONAL ABSTRACTS

Underlying Factors in the Zinc Ionization Treatment of Middle Ear Infections. D. M. Lierle, and R. A. Sage.

Annals of Otology, Rhinology and Laryngology, **41**:359-368 (June) 1932.

The purpose of this investigation has been to determine the effects of zinc sulfate upon bacteria, with and without the electric current, and also to study the extent of the electroplating of tissues during ionization.

On the supposition that zinc remained in the tissue, a number of experiments were made to find out to what extent this occurred. First, x-ray pictures of the ionized tissue were taken. The results were negative, showing no deposition of metallic zinc, probably because the particles, if present, would have been of such minute size that the emulsion of the film would have obscured them.

A second group of experiments involved the electrolysis of zinc sulfate solution in a tube in which the cathode was separated from the anode by a silica gel bridge. A phosphate buffer mixture with *p*H of 7.4 was placed around the cathode. If zinc ions migrated into the gel, a white layer of zinc phosphate should be formed, or a layer of metallic zinc should be visible. The same current as advocated in the usual treatment and even three times this current was applied in these experiments. No metallic layer was visible. In another experiment, an agar bridge was substituted for silica. The surface of the agar next to the anode and the zinc sulfate solution was shrunken and withered after the experiment. The usual current of 4 milliamperes was applied for 20 minutes. No layer indicating the deposition of a zinc salt was seen, even upon examination with the microscope. One of the silica gel bridges was allowed to stand with the solutions on each side for 24 hours. The current had been used for twenty minutes only. A white deposit in the center indicated that the zinc sulfate and the phosphate buffer had diffused into the gel.

The third method of approach was the qualitative chemical analysis of tissue following ionization of the tympanic cavity. The patient had received the ionization treatment twice prior to the operation, the second treatment being given about four hours before the removal of the tissue. The tissue equaled in mass an average size garden pea. It was digested with sulfuric and nitric acids, brought to a *pH* of 4.6 with sodium hydroxide, and the precipitation of zinc as the pyridine thiocyanate was carried out according to the method of Pagel and Ames. No precipitate, indicating the presence of zinc, was visible even after four hours' standing.

Lastly, analysis of ionized tissue by the spectrograph was done. The infected membrane from the frontal sinus of a dog was selected as a suitable area for experimental study of the ionization treatment. The area was ionized in the usual manner, and the excess zinc sulfate was washed out with normal saline to remove any zinc occluded by the tissue. The infected membrane was then removed and put into a pyrex flask for digestion. The other frontal sinus was used as a control and was treated in the same manner as in the experiment just described. This time, however, no electric current was used. The sinus was filled with zinc sulfate solution and allowed to remain for the usual twenty minutes. The membrane was then washed with normal saline as before and an equivalent amount of tissue removed.

Both ionized and control samples were digested with sulfuric and nitric acids until a colorless solution was obtained. These samples were analyzed by the spectographic method.

The analysis of the tissue shows the following:

1. There is only one line in the plate which might be assigned to zinc. Since this line is no more persistent than the others indicated, there is no reason to believe it is zinc.

2. Should the above line be due to zinc, since it occurs in both the control and the electrolyzed tissue, it would probably be due to traces of zinc in normal tissue, as in the case of the calcium and magnesium shown.

Three photographs of both control and ionized tissue specimens were made. The lines in the spectrum indicating the presence of magnesium revealed that the sample of material used was sufficiently large to detect even faint traces of zinc had they been present. The spectrometric method is the most reliable analytical procedure for the determination of zinc in small amounts of tissue.

The second phase of this article is concerned with the study of the bactericidal effects of $ZnSO_4$ with and without electric current.

The zinc sulfate employed was a 2 per cent (1-50) solution of Mallinckrodt's C. P. grade. The salt was the hydrated variety containing seven molecules of water. It contained, according to the label, no arsenic nor heavy metals. Iron, 0.001 per cent, and manganese, 0.001 per cent, were present. In the heaviest concentration in these experiments, 0.0024 mg. of manganese was present. There is no reason to suppose that manganese or iron in these concentrations could exert any definite antiseptic effects.

Glass bottles of 50 cc. capacity were set up with electrodes of 3 mm. zinc wire spaced 1 cm. apart. The electrodes were inserted through a rubber stopper. For a control, a similar bottle was used, with a plain rubber stopper. The equipment and solutions used were autoclaved for fifteen minutes at 15 pounds pressure. All glassware was chemically cleaned with strong chromic acid. All dilutions were made with accurate pipettes. The total volume of fluid in each case was between 10 and 14 cc.

Pure cultures of the organisms were obtained and subcultured on blood agar slants. Suspensions were

made with 4 to 6 cc. of distilled water. One cc. of the suspension was used in each case. Two bottles were set up for each dilution, and the organisms were subjected to the treatment for fifteen minutes. In the ionized sample the current was kept between 3 and 4 ma. The bottle was rotated from time to time to insure thorough mixing. The cathode was darkened by a slight, powdery deposit of zinc at the end of the experiment. The organisms were recultured directly to blood agar plates and growth compared to that on a blood agar control slant at the end of 24 hours. The control slant was considered 4 plus.

Cultures of *Staphylococcus aureus, Streptococcus viridans, Streptococcus haemolyticus,* pneumococcus, diphtheroids and *B. coli,* all isolated from virulent colonies, were subjected to the action of zinc sulfate with and without the 4 milliampere direct current. The bactericidal action of the zinc sulfate solution alone was fully as effective as the combined action of the zinc sulfate and the electric current. Four milliamperes of electric current applied for fifteen minutes to a suspension of *Streptococcus viridans* in normal saline had no appreciable effect on the viability of the organism. This organism did not survive a similar exposure to 1:50 zinc sulfate solution without passage of the current. Pneumococcus was also readily destroyed by zinc sulfate. *B. coli* and *Staphylococcus aureus* were the most resistant of the organisms studied. The primary effect of the ionization treatment is, therefore, due probably to the bactericidal action of the zinc sulfate solution.

A group of cases was studied, that the hydrogen ion change during the ionization treatment might be observed. The change was slight, and the increase in *p*H concentration was not noticeable. It was felt that the purulent discharge, which is always present, and the amount of surface exposed, all contribute to cause a variation in the *p*H of the solution. The acidity of the solution may exert an antiseptic influence by itself, in addition to the bactericidal effect of the zinc ion. Otherwise, the shift in *p*H of the solution during the treatment is not particularly significant, since the actual shift in *p*H is marked by so many uncontrollable factors.

An attempt to analyze the zinc sulfate solution before and after treatment is theoretically unsound, since the zinc is replaced from the anode which becomes partially dissolved during the electrolysis. Suppuration occurs during the treatment, and this alone dilutes the zinc solution sufficiently to introduce great error. — *Int. Digest,* (August) 1932.

The Influence of Ultraviolet Rays on the Cholesterin Metabolism. Part II. R. Hubert.

Arch. f. Gynak., **149**:433, (May) 1932.

Eighteen female patients, half of whom had genital carcinoma and the other half had acute gynecologic infections, had their cholesterin content estimated before and after exposure to ultraviolet rays. The patients were then given the usual clinical care, viz., radium, x-ray or operative treatment for malignancies, and surgery or conservative measures for the infections. A second study followed, after a lapse of time, and the cholesterin content before and after ultraviolet irradiation was again determined. It was noted that a drop in cholesterin followed irradiation before the clinical treatment, whereas a constancy or increase of cholesterin was demonstrable after the cure. While this phenomena occurs in pregnancy and in cases of abnormal pigmentation, the author believes that it is of value in determining recurrences in carcinoma treated cases and in acute infectious processes to determine whether the time for operation is "ripe."

End-Results of Radium Therapy in Carcinoma of the Cervix. Floyd E. Keene and Robert A. Kimbrough.

Amer. J. Obstet. and Gynec., **23**:838, 1932.

This report summarizes the end results of radium treatment in cases of carcinoma of the cervix during the period from 1913 to July, 1926. Follow-up data was obtained in 89.15 per cent of cases. They were arranged according to the classification of H. Schmitz; four-fifths of the cases were found in the inoperable stages. Their primary mortality was 0.63 per cent, distributed in three cases as follows: a death from embolus on the sixth day, following cautery amputation and radium, a death from septicemia on the fourteenth day, and a death on the 26th day from pelvic peritonitis. In the five-year end result cures those cases untraceable were classified as failures in treatment, and out of a total of 475 patients treated, 73 survived five years or more. This included all stages of the cancer development, whereas when classified according to the results of patients in their various stages of the disease development it was found that 32.6 per cent five-year cures were obtained in the operable group as compared with 11.14 per cent in the inoperable group. It was also noted that in the best operable group or the first stage in which 34 patients were treated by cautery or radio knife immediately followed by radium application, resulted in 18 patients living five or more years without recurrences or 52.94 per cent. Analysis of biopsy determined cases, which were arranged according to the histologic types of Martzloff, showed that the spindle cell type which is highly radio sensitive had nevertheless a low curability rate, which would indicate that its degree of histologic malignancy was of greater prognostic import than the radiosensitivity of the tumor. The best results were obtained in the transitional group which is explained by its decreased malignancy as compared to the spindle cell type and its lessened radio resistance as compared with the prickle and adenoma types of carcinoma.

Ultraviolet Light and Hormones. Prof. H. Kuestner and Dr. W. Eissner.

Klin. Wochenschr., No. 12, 1932.

A short time ago, the authors found that the hormone of the anterior lobe of the hypophysis could be changed by ultraviolet light. American authors have found in animal experiments that the action of Insulin is diminished if it is irradiated with UV. before its injection. The authors have investigated this fact and found that the action of Insulin really is

diminished by irradiation with UV., but only temporarily; after a few hours, the irradiated Insulin regains its full effectiveness. UV. irradiation therefore seems to cause only a very slight change in the structure of the Insulin molecule. However, these results do show that UV. can cause an unfavorable change in the body hormone. Persons with hormonal dysfunction should therefore not be exposed to UV. irradiations except with the greatest precautions, so as not to produce a further lessening of the strength of the hormones in the organism. — *Ars. Medici,* (July) 1932.

Diathermy in Cases of Rheumatic and Nervous Ailments. Dr. E. Tobias, Berlin.

Diathermy should be used only in chronic cases of muscular rheumatism, and for these cases general d. with one to two plates for the back and four for the extremities. Other thermal procedures are more effective for very painful cases. Localized myalgia reacts especially well. Mild d. is usually much more effective than intensive d. If the plate (as large as possible) that is applied cannot be tolerated, the diseased area should be placed between two electrodes. In cases of torticollis, d. or the steam-jet is combined with kneading-massage and simultaneous stretching movements. Likewise in cases of lumbago (only old cases!), possibly with blue light as well. Short, mild d. (ten minutes) is also effective in cases of headache due to rheumatic indurations in the scalp.

In cases of arthritis, d. comes into consideration likewise only for the subacute and chronic forms. Arthritis deformans responds best to the d. Effusions into joints are more effectively treated with hot air, arthritis fibrosa with fango or mud packs. D., on the other hand, is superior to all other heat procedures in cases of coxitis, especially when the joint is warmed through each time in various planes. Mechanotherapy only after severe pains have disappeared, when possible first under steam.

Neuritis usually reacts better than neuralgia. In cases of neuritis, intensive, in cases of neuralgia mild d. is more effective. D. is of use in only the mildest cases of trigeminal neuralgia (warmed, large electrode over all three branches, minimal strength of current, indifferent electrode on the back of the neck, current turned on and off gradually). Brachialgia (secondary in cases of aneurysma of the aorta, omarthritis, diseases of the cervical vertebrae, etc.) can appear primarily as a rheumatic neuritis, less commonly as a toxic neuralgia (malaria, grippe, diabetes, etc.). D. is very valuable even in the acute stage of neuritis. In cases of acute neuritis, weaker currents are more effective, whereas stronger currents are better for the chronic forms. If the most pain is localized in the region of the inner edge of the shoulder-blade, radiating from this point into the arm, one electrode is first applied there and the other parallel to it on the chest, and then the longitudinal d. of the arm follows. Anaesthetic zones are best left uncovered (danger of burns). — In cases of intercostal neuralgia (often secondary in lues spinalis, tumors of the vertebrae, aneurysma of the aorta descendens), the electrodes are applied in front and in back. The most pronounced form is herpes zoster. Mild d. in combination with blue light has here proved of value after the vesicular eruption has receded. — D. is ineffective in cases of occupational neurosis with strong fibrillary contractions. — In cases of sciatica (differential diagnosis: coxitis, muscular rheumatism, lancinating pains of tabes, flatfoot, prostatitis, cancer of the rectum, adnexitis, etc.), we are more frequently dealing with a neuritis (absence of the Achilles jerk, disturbances of sensibility, later, muscular atrophy) than with a neuralgia (grippe, malaria, diabetes). In the acute stage, d. is contraindicated. Later, mild longitudinal diathermy, one electrode in the region of the loins, the other one the sole of the foot (in the case of sensitive patients double electrode on both soles), in cases of sciaticas with root symptoms (bilateral Lasègue), combined with transversal diathermy as in lumbago. — In cases of neuritis cruralis (patellar reflex absent or weakened, pain often localized in the knee as in coxitis), one electrode under the flexure of the groin, the other over or under the knee. — D. is very effective in cases of meralgia paraesthetica (neuritis of the n. femoris cutaneus externus; usually found in middle-aged men). The electrodes are applied over and below the painful anaesthetic zone on the thigh.

In cases of claudicatio intermittens, galvanic legbaths (segmental irradiation with Roentgen, Padutin injections, sympathicodiaphtheresis — Ed.), have proved most valuable, but d. also alleviates pain. The lancinating pains of tabetic patients are sometimes influenced by d. (segmental and longitudinal diathermy). General d. has a sedative and sleep-inducing action in cases of functional neuroses (one to two plates on the back, one plate on each of the soles). D. of the abdomen is recommended for cases of cerebral congestion. — *Ars Medici* (July) 1932.

Antirachitic Value of Milk from Cows Fed Irradiated Yeast. Edwin T. Wyman, and Allan M. Butler.

American Journal of Diseases of Children, **43:** 1509-1518 (June) 1932.

Because of the possibility of difference in the specific factors in "yeast milk" and viosterol, and because there are certain advantages in the inclusion of the antirachitic factor in the food of infants rather than adding it as a separate therapeutic agent, the authors studied the effectiveness of such "yeast milk" in the healing of active rickets in children.

Two infants and two children with advanced active rickets were selected for this study. On admission the patients were placed in a ward and given a simple diet adequate for their caloric requirements. Each subject was then observed for a period of from 10 to 23 days to make sure that healing was not taking place. In order to determine this, roentgenograms of the long bones were taken, and the calcium and inorganic phosphorus contents of the serums were determined at regular intervals. In the taking of blood samples and separation of the serum, care was taken to avoid hemolysis. The

serums were separated immediately and the inorganic phosphorus determined at once. Calcium was determined by the method of Fiske and Logan, 2 cc. of serum being used for each determination, and inorganic phosphorus was determined by the method of Fiske and Subbarow. Being satisfied in this control period that healing was not occurring, the milk in the diet of each child was replaced by the special "yeast milk."

Eighteen recently freshened cows from a "certified" dairy herd were used. The group was comprised of Holstein-Friesian, Jersey, Guernsey and Ayrshire females, milking between 25 and 35 pounds (11 to 15 kg.) of 4 per cent milk daily on a two-time milking schedule. Their basal ration consisted of 30 pounds (13.6 kg.) of corn silage, 12 pounds (5.4 kg.) of chopped alfalfa and clover hay, 4 pounds (1.8 kg.) of soaked beet pulp, and 12 pounds of a 17 per cent protein grain mixture. Nine of the cows received, in addition, 60,000 rat units as irradiated yeast daily. The milk produced by these nine cows was used as the special "yeast milk." The remaining nine cows received the basal ration and were held as replacement in the event that any of the experimental animals had to be withdrawn during the course of the experiment. The cows were stanchioned in a barn except when exercised in a paddock free from vegetation. The appearance, appetites and quantity of milk produced were normal for all the cows through the experiment.

In the experiments on the first three patients this milk was pasteurized before being fed. In addition to being pasteurized, the milk, before being fed to the fourth patient, was boiled for five minutes. In every other respect the routine was continued as nearly as possible as in the control period. The subjects were confined in bed in the wards throughout the entire time. Roentgenograms were taken and serum calcium and phosphorus determinations made in order to follow the progress of the therapy. During the period of study the children made satisfactory gains in weight.

The fall in serum phosphorus in the control period of case 4, the rise in serum phosphorus with the substitution of the special milk and the maintenance of a high serum calcium throughout the following two months in the presence of active healing, give evidence that the boiled special milk had definite antirachitic properties.

In cases 1, 2 and 3, after the patient had been on the pasteurized yeast milk for approximately two weeks, the calcium-phosphorus product had risen to 47 mg. or above. In case 4, after the patient had been on the boiled yeast milk régimen for two weeks, the product had risen to 38.2, but roentgenograms showed definite healing. At the end of 28 days on the boiled yeast milk diet, the calcium-phosphorus product had risen to 49.3. Though healing continued to complete recovery, it did not take place as rapidly as in case 3, in which almost complete healing occurred in six weeks.

It would seem that a calcium-phosphorus product of less than 30 had to be reached before the deposition of a calcium phosphate, opaque to the x-rays, in osteoid tissue ceased. When the calcium-phosphorus product was, roughly, from 30 to 34, calcium phosphate was deposited, but the deposition was insufficient to provide adequately for the growing osteoid tissue in these growing children. In case 4, sufficient deposition of calcium phosphate occurred with a calcium-phosphorus product of 38 to permit the appearance of healing of advanced rickets as determined by roentgenograms. These figures would lead one to believe that the presence of a calcium-phosphorus product of approximately 30 permitted calcium phosphate deposit in bone. The value of the calcium-phosphorus product which in a given case will permit complete calcification of osteoid tissue probably depends on the rate of growth of the individual.

Bucky's Border Rays. Dr. G. Bucky, Berlin.

Zeitschrt. fr. ärzt. Fortbild. No. 2, 1932.

Bucky's rays are over-soft, long-waved x-rays, which are therapeutically related to the shortest-waved UV. They are almost completely absorbed by the skin, only a small fraction reaching the subcutis. Deep injuries need therefore not be feared. The acute skin reactions are similar to those of UV.: Erythema, formation of vesicles, excoriations. The modern technique of measurement makes exact dosing possible.

The border rays are of particular value in cases of skin disease, since the dosage can be increased without danger till the desired reaction sets in. They are the therapy of choice in cases of sclerodermia and lupus. The best cosmetic results can be obtained in cases of naevus flammeus by the use of small doses in intervals of eight weeks. Surprisingly good results are obtained in cases of naevus pigmentosus. In cases of haemangioma, the cosmetic results are much better than when radium is used. The border rays also have the advantage that they can be used without danger on delicate spots, for example, the eye-lids. This also holds for disseminated psoriasis (no x-ray hang-overs, no injuries to the glands, no falling out of hair in cases of psoriasis of the scalp). Excellent results are also had in cases of mycosis fungoides, m. Darier, epitheliomas, dissecting-porters' wart, vitiligo (general irradiations!). X-rays, on the other hand, are more effective in cases of acne juvenilis and keloids. Seborrhoic eczema does not react favorably to border rays.

In cases of affections of the anterior part of the eye, particularly in cases of keratitis and corneal ulcer, *Meller* emphasizes that the pains can sometimes be relieved after only one treatment (see »Ars. Medici«, 1931, p. 222). Since the treatment takes no more than a minute at the most, it should be applied in every case. According to *Krasso,* intraocular pressure in cases of glaucoma is decreased by general irradiation with border rays.

Mild general irradiations without skin reactions (about one minute daily, if indicated for months at a time) have an analgesic, antispastic, and alterative action. This fact provides for a great number of indications, among which special mention might be made of climacteric polyarthritis, polycythaemia rubra, angina pectoris, occupational eczema, ulcus ventri uli et duodeni, m. Parkinson, diabetes mellitus. — *Ars. Medici* (July) 1932.

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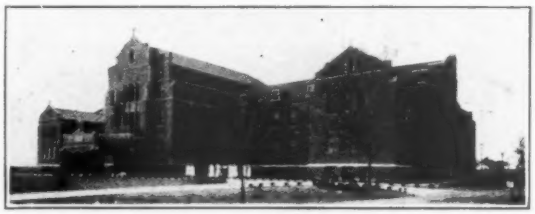

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Of Archives of Physical Therapy, X-Ray, Radium published Monthly at Chicago, Ill., for October 1, 1932.

State of Illinois, } ss.
County of Cook. }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared A. R. Hollender, M.D., who having been duly sworn according to law, deposes and says that he is the Managing Editor of the Archives of Physical Therapy, X-Ray, Radium and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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Editor — Disraeli Kobak, M.D., 30 North Michigan Ave., Chicago, Ill.

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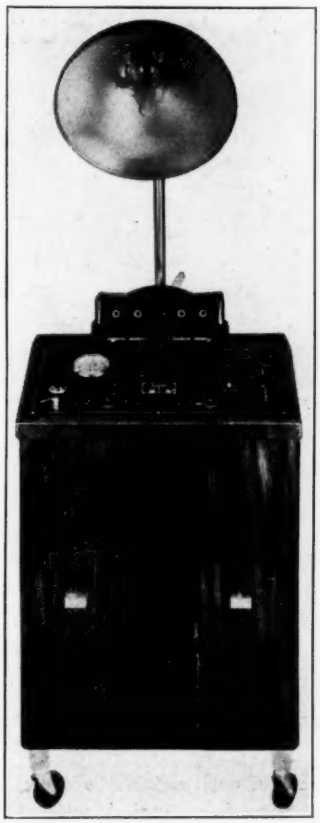

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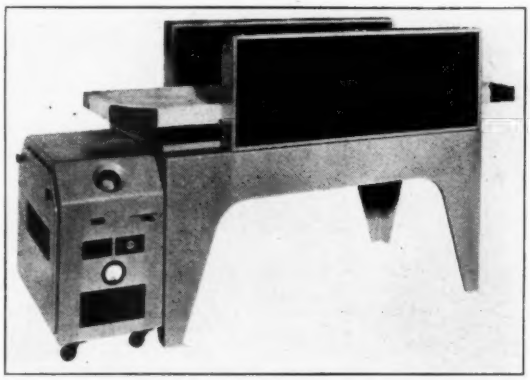

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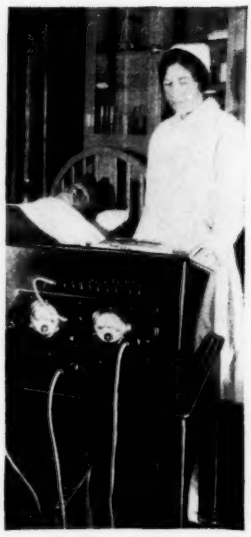

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